# American Machinist

DECEMBER 30, 1957 PRICE 75 CENTS

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION


## Tolerance Charts Predict Reliability

page 81

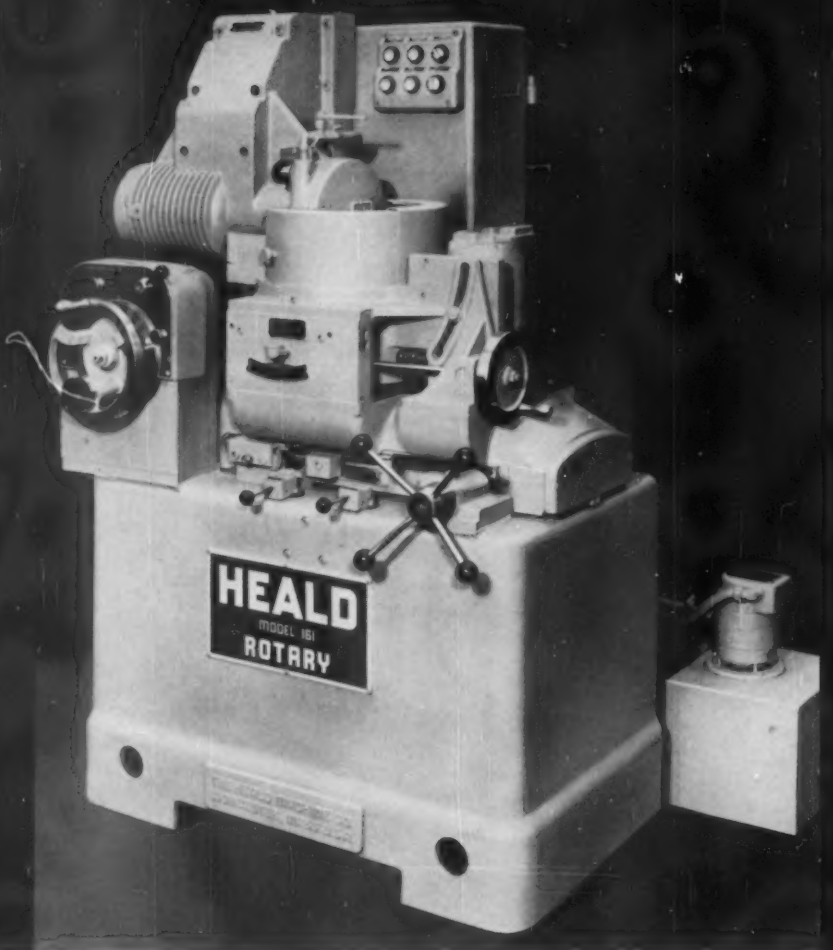
Ultrasonics seeks flaws in steam turbine shaft—see page 85

- **How grinding affects fatigue strength,** page 72
- **200 times the punch life with metallized Moly,** page 77
- **New plastic properties by irradiation,** page 90


NEWS INDEX page 53

CONTENTS page 1

# There's a NEW LOOK and NEW PERFORMANCE in this 1958 Model!




## *Here's what the new Model 161 Rotary can do for you...*

***Greater Precision***—Dial knob type feed box now permits incremented feeds of .0001 from 0 to .0006 for rough grinding, changing automatically to .0001 fine feed at any point from 0 to .005 before finish size.

***Finer Finish***—Rugged cradle-type chuck bracket and swivel adjustment minimizes chatter. And vibration-free diamond unit gives wheel a smoother dress.

***Easier Operation***—Anti-friction table ways give easier manual reciprocation. Four ounce pressure moves the 590 lb. table.

***Higher Production***—Hydraulic table feed rates infinitely variable from 0 to 10 fpm. Permits smooth slow dressing speed, changeable instantly to rapid traverse or reciprocating speed.

***Greater Versatility***—A manually operated machine is easily changed over to hydraulic operation simply by adding a power pack.

***Less Maintenance***—Anti-friction table and base ways are grease packed for life and sealed to exclude foreign matter. Hydraulic table design minimizes spare parts inventory and reduces maintenance and attention.

The 1958 Model 161 Rotary Surface Grinder is ideally suited to all small work grinding operations, on a high production or job-lot basis. Grinds flat, convex or concave surfaces of work up to 6 in. O.D. For complete information, send today for Bulletin 2-161-2 Issue 1.

***IT PAYS TO COME TO HEALD!***

**THE HEALD MACHINE COMPANY**

Subsidiary of The Cincinnati Milling Machine Co.

**Worcester 6, Massachusetts**

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD®

American Machinist
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

NEWS REPORT ..

. . . Spot News . . 53
. . . Washington . . 55
. . . Detroit . . 57
. . . Aircraft and Missiles . . 59
. . . Machine Tools . . 61
. . . What's Ahead . . 63
. . . General News . . 110
. . . Field Report . . 116
. . . Names . . 119

Departments...

Letters . . 46
Editorial . . 67
Practical Ideas . . 97
Talking Shop . . 109
New Equipment . . 120

## contents for December 30, 1957

VOLUME 101, No. 27

**Impact extrusion depth-to-diameter ratio is 32:1 . . .** An extruded rocket tube more than 8 ft long is made from aluminum. *By John R Saul, Chance Vought Aircraft, Inc.* . . . . . 69

**How grinding affects fatigue strength . . .** Studies show the possibility that control of grinding stresses may be able to increase fatigue strength. *By L P Tarasov, Norton Co.* . . . . . 72

**200 times the punch life with metallized Moly . . .** Coating does the trick on sizing punches at Buick. *By George H De Groat.* . . . . . 77

**Simplified gundrill sharpening avoids production delays . . .** Two sharpening fixtures and a sight gage make it easy. *By Fred Bloch, Eldorado Tool & Mfg Corp.* . . . . . 78

**Tolerance charts aid dimensioning for machining . . .** Such charts give a better indication of the reliability with which you can produce specified tolerances. . . . . 81

**Ultrasonic inspection makes turbine forgings safer . . .** How developments in ultrasonics find hidden flaws that could cause turbine failure. *By R N Hafemeister, Allis-Chalmers Mfg Co.* . . . . . 85

**Thermoplastics are thermosetting after irradiation . . .** Bombarding polyethylene with high-speed electrons raises the heat resistance. *By George H De Groat.* . . . . . 90

**Optical gaging checks 1 ft error in 1 mile . . .** Compact optical instrument measures angular displacement of an adjustable reflector. *By W W Henninger, Daco Instrument Co.* . . . . . 92

**Overhead conveyors feed assembly benches . . .** Novel conveyor design loads cable conveyors built into assembly benches. *By James V Jensen, Minneapolis-Honeywell Regulator Co.* . . . . . 94

### REFERENCE BOOK SHEETS

**Forming Data for part details, IV . . .** Data on internal flanged holes and elongated internal holes. *Courtesy Republic Aviation Corp.* . . . . . 103

**Shaving-tool corrections . . .** Formulas to calculate the step on shaving tools for three conditions. *By I Zorich.* . . . . . 105

**Inch-to-millimeter conversion tables . . .** Two conversion tables that are unusually easy to use. *By Gustav Hirsch, Chanita Metal Works.* . . . . . 107

# American Machinist chips

**Tired metal...** The problem of fatigue failure of metal parts grows more important as we apply metals at points near the limits of their properties. If you do something in machining metal that reduces the fatigue strength you may use up the safety factor and cause the part to fail in service. This could lead to anything up to a crash of a jet transport. On the other hand you might do something that *raised* the fatigue strength; that opens a more pleasant field of speculation.

**Whether grinding** has any effect on fatigue strength has been argued for years. Now a study by Batelle, Mellon, and Norton sheds new light on the whole subject and opens the way to putting residual stresses to work for you. Dr. Tarasov of Norton summarizes the recent work in this field in "How Grinding Affects Fatigue Strength" on page 72.

**More punch with Moly...** Buick has doubled the life of sizing punches by metallizing them with molybdenum. George De Groat tells how on page 77.

**Reliability...** We hear more and more about this subject for several reasons. Aircraft and missiles, especially the latter, set new requirements for reliability. Automation may make it more important just from a production standpoint. You can't assemble by machine if the parts are not within tolerance. You may find the answer to this problem lies in tolerance charts that will show whether you can produce the specified tolerances by the methods you plan to follow. We suggest you give this method a try on critical parts. See William K Wood's description on page 81.

**Rocket tube...** When Chance Vought was working on the Mighty Mouse rocket launcher, there was some difficulty with the production of the rocket tube. Hunter Douglas was able to produce an extrusion for the part that has a depth-to-diameter ratio of 32:1. The story of the development of this extrusion is told by John R Saul in the article starting on page 69.

**Coming...** *AM* for Jan 13 tells the inspiring story of how an old plant was brought to life, and tells it in full color. You'll find out how Sperry inspects gears to ± 1 sec of arc, and you'll find articles on reaming, barrel finishing, electrolytic grinding, and material handling.

## *Cover...*

Ultrasonic test of steam turbine shaft at Allis-Chalmers by 1 megacycle double-crystal technique is shown in picture by Clarence Hansen. For further details see story on page 85.


ALBERT HAUPTLI publisher

BURNHAM FINNEY editor

ANDERSON ASHBURN managing editor
RUPERT LE GRAND senior associate editor

BEN BROSHEER (Chicago) associate editor
H E LINSLEY associate editor
CHARLES D EMERSON associate editor
WM M STOCKER, JR associate editor
JOHN P WRIGHT associate editor
GEORGE H DE GROAT Detroit editor

ANN McTAGUE assistant editor
TOM JOHNSON assistant editor
GOSTA WERNBERG assistant editor
RICHARD T BERG assistant editor
JOHN J DWYER, JR assistant editor

RICHARD E ROOMAN art director
JOSEPH S POZNANSKI assistant
ANNE PALMER assistant
MATTHEW T HAGGERTY assistant

ROBERT SHEETS news editor
DONALD MacDONALD Detroit
WILLIAM G MELDRUM Cleveland
MARGARET RALSTON San Francisco
JOHN SHINN Los Angeles
MICHAEL J MURPHY Los Angeles
CHARLES T DIXON, JR Atlanta
KEMP ANDERSON, JR Dallas
WILLIAM J COUGHLIN London
ROBERT E FARRELL Paris
PETER WEAVER Rio de Janeiro
MORRIE HELITZER Bonn
DAN KURZMAN Tokyo
JOHN H KEARNEY Mexico City
DOUGLAS GREENWALD statistician
M K MATULIS assistant statistician

DEXTER KEEZER director economics dept
GEORGE B BRYANT, JR chief Washington bureau
JOHN WILHELM editor world news
FRED H COLVIN editor emeritus

GEORGE REPPERT, JR advertising sales manager
RUSSELL T DOUGLAS business manager
ROBERT C MATTOON circulation manager
CATHERINE C KANE manager, reader service



*American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index. American Machinist publishes its own annual index; this is available on request to the editor.*

**American Machinist**, published bi-weekly; with an additional issue in mid-September, by McGraw-Hill Publishing Company, Inc, James H McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, CIRCULATION, ADVERTISING and PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd St, New York 36, NY. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Subscriptions are solicited only from production executives and engineers in the metalworking industries. **Position and company connection must be indicated on subscription orders.**

**Postmaster: Please send form 3579 to American Machinist, 330 West 42nd St, New York 36, NY**

United States subscription rate for individuals in the field of the publication $5.00 per year, single copies 75 cents, foreign $25.00 per year, payable in advance. Second-class mail privileges authorized at New York, NY. Printed in USA. Title registered in U S Patent Office.



© Copyrighted 1957 McGraw-Hill Publishing Co, Inc, all rights reserved.



SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, American Machinist, 330 West 42nd St, New York 36, NY. Subscribers should notify Subscription Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

# A Time for Resolution

In 1958, we will be taking the Eighth American Machinist Inventory of Metalworking Production Equipment.

This comprehensive study gives the amount, age, and distribution of machine tools and presses; of welding, heat treating, cleaning and materials handling equipment. It is a key part of our continuing program to find and report the ways in which you can cut the cost of production.

Preparing the data on your plant for this Inventory will give you a new insight into the condition of your manufacturing plant. Comparing your data with the published totals will give you a clear picture of how you stand in relation to your competitors and to other plants in your area. Study of the published totals aids government agencies in mobilization planning.

The increasing pressure of the cost-price squeeze, the fact that more attention has been given to adding new plant capacity than to modernizing existing plants in recent years, and the acute need to hold costs at a minimum all combine to make the taking of the AM Inventory especially timely in 1958.

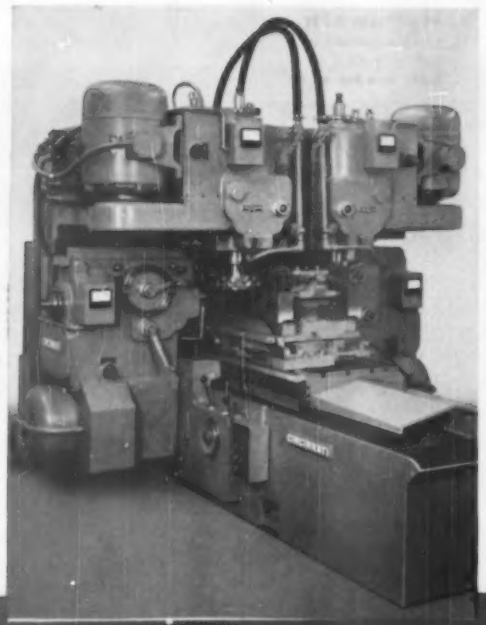
The Inventory has long represented the only comprehensive source of information on the equipment installed in metalworking plants. It is probably the most extensive research project regularly performed by any business magazine.

But more than anything else the success of past Inventories has been a tribute to the men in thousands of metalworking plants who have taken the time and trouble to prepare, and have had the confidence to entrust us with, the detailed data on their equipment that is required.

Early in 1958 the forms for this new Inventory will be going out to metalworking plants throughout the United States. We are resolved to make the data even more complete and useful than was the Seventh Inventory in 1953.

You can help in this project by resolving now that your plant will be among those counted. You will find an immediate reward in the depth of knowledge it gives you of your own plant. More broadly, you will be participating in the periodic summing-up of metalworking capacity so important to industry and the nation.

*—The Editors*



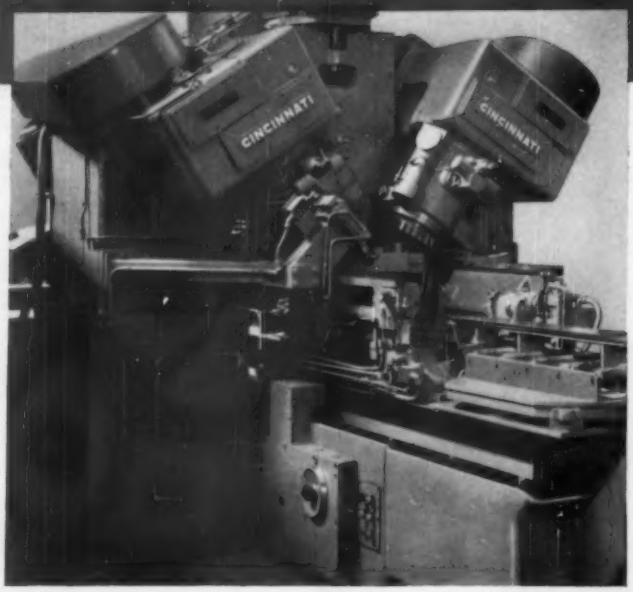
**HyPowermatic** equipped with a pair of vertical spindles in addition to the standard duplex horizontal spindles. Each has individual 20 hp motor drive. Tooling is for a low-cost production job of milling recesses and adjacent faces on various sizes of yokes.

**HyPowermatic** with 50 hp main drive and two vertical spindles in a fixed housing, tooled up to mill the top and combustion face on cylinder heads. Many standard HyPowermatic units and features are incorporated in this machine.

CINCINNATI

# Easy on Your Replacement Fund

**HyPowermatic** with vertical spindle in fixed housing, tooled up to mill the motor mounting face and water outlet flange on crankcase covers. The spindle carrier has 8 speeds; 6" vertical adjustment of quill; automatic quill retraction.

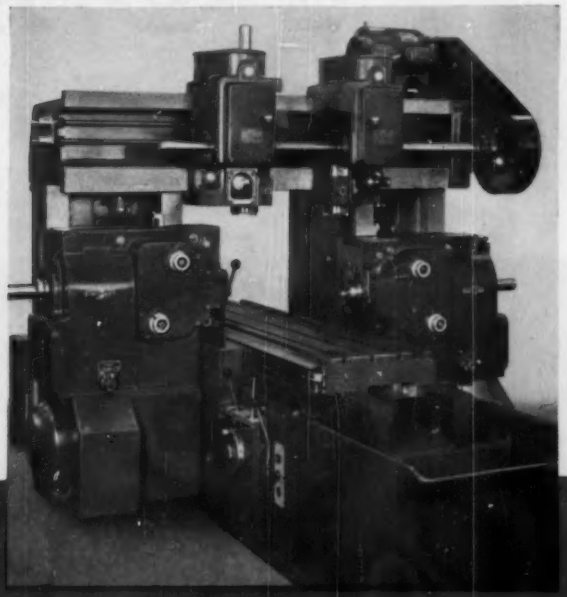



**HyPowermatic** with two angular spindle carriers, each equipped with automatic quill retraction and powered by a 40 hp motor. A third spindle is mounted horizontally. This machine is tooled up to mill the banks and radius on cylinder blocks.

# CINCINNATI

SPECIAL MACHINE TOOLS AND

**HyPowermatic,** duplex style, equipped with highly useful complementary units consisting of two additional spindle heads mounted vertically on a cross rail. This HyPowermatic can mill simultaneously the sides and top of box-shaped parts.



# ...Cincinnati HyPowermatic Plan

## *of standard basic and complementary unit construction*

Don't discard new production milling ideas without considering CINCINNATI HyPowermatic plan of standard basic and complementary unit construction. You may find that a special machine is entirely unnecessary. HyPowermatics are assembled from standard basic and complementary units to give you unusual cost-reducing combinations such as:

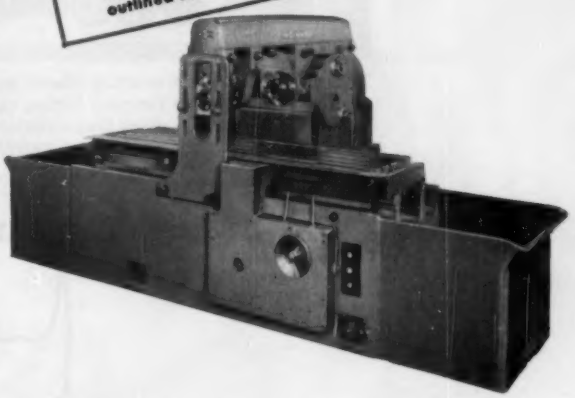
1) Close-coupled spindle carriers
2) Vertical and angular spindle heads; many styles and combinations, including adjustable angle
3) Ram mounted spindle heads
4) Fixed height or adjustable bridge type rail support for vertical spindle heads

Take a look at the heavy duty automatic milling machines in your shop which may have become productively obsolete. You may be surprised to see how much you can gain—in production and lower unit cost—by replacing with CINCINNATI® HyPowermatics, built up with standard basic and complementary units to suit the job. They offer many cost-cutting replacement possibilities. May we send you a copy of the new, fully illustrated catalog? For brief specs, look in Sweet's Machine Tool File.

***Special Machine Tool Division***
**THE CINCINNATI MILLING MACHINE CO.**
**CINCINNATI 9, OHIO**

**CINCINNATI Plain HyPowermatic Milling Machine**

one of 42 sizes. Duplex and Tracer Controlled styles available, also in 42 sizes of each. All are outlined in catalog No. M-1909-1.



COMPLETE PRODUCTION LINES

# POWER to build delivered

Lorain-56 Shovel-Crane is 1¼ yard shovel, 25-ton crane, or 30-ton crane as desired, features torque converter to absorb working shocks and stresses, 2-lever air controls for easier operation.

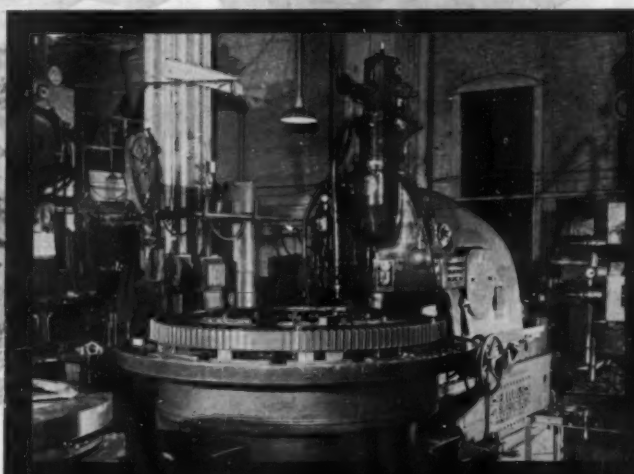
Lorain Moto-Cranes* combine speed, power and versatility available in a range of lifting capacities from 7 to 75 tons. Multiple speed transmission, multiple big tires provide exceptional off-road mobility.

THE PRECISION LINE

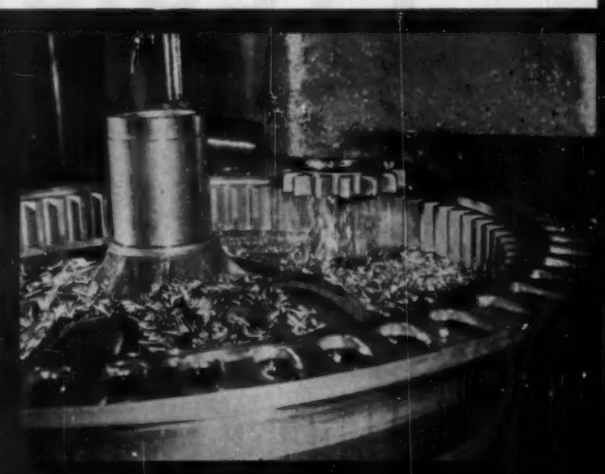
Fellows

*Reg. U.S. Pat. Off.

# America's Highways...
# by FELLOWS-CUT GEARS



120-Inch Gear Shaper set-up for 138-tooth cast steel gear of 290-330 Brinell, 5" face width, 1.783 C.P., 1.180" total depth of cut: Four cuts—1181 min. approx.



100-Inch Gear Shaper cutting 73-tooth internal gear, 3½" face width, 1.8235 D.P., 1.007" depth of cut. Material—steel casting 197-235 Brinell. One cut—320 min. approx.

**The machines that move mountains of material for America's highway programs demand good, rugged, smooth running gears that will transmit, without failure, the many tons of force required.**

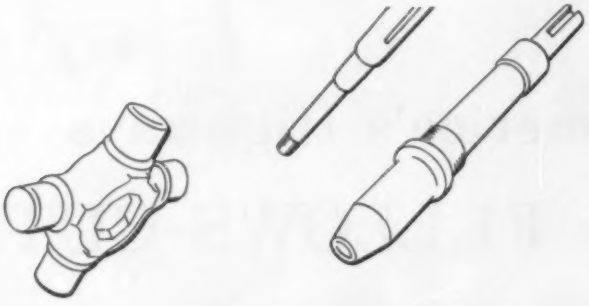
**The well known Thew Shovel Company of Lorain, Ohio is one of the major construction equipment makers that use Fellows machines to produce these gears. The largest Thew-Lorain gears require the largest capacity Gear Shapers in the Fellows Line, the 100-Inch and the 120-Inch.**

**These two Gear Shapers are designed to take heavy cuts at coarse feeds on spur or helical gears. Capacities: 28" to 100" for externals and 46" to 100" for internals on the 100-Inch; 28" to 120" for externals and 46" to 120" for internals on the 120-Inch. Maximum face width on each is 8".**

**For *full* information about the complete Precision Line of cost-cutting Fellows Gear Production Equipment get in touch with your Fellows representative. Write, wire or phone any Fellows office.**

**THE FELLOWS GEAR SHAPER COMPANY**
**78 River Street, Springfield, Vermont**
**Branch Offices:**
**1048 North Woodward Ave., Royal Oak, Mich.**
**150 West Pleasant Ave., Maywood, N.J.**
**5835 West North Avenue, Chicago 39**
**6214 West Manchester Ave., Los Angeles 45**

*Gear Production Equipment*



Now you can

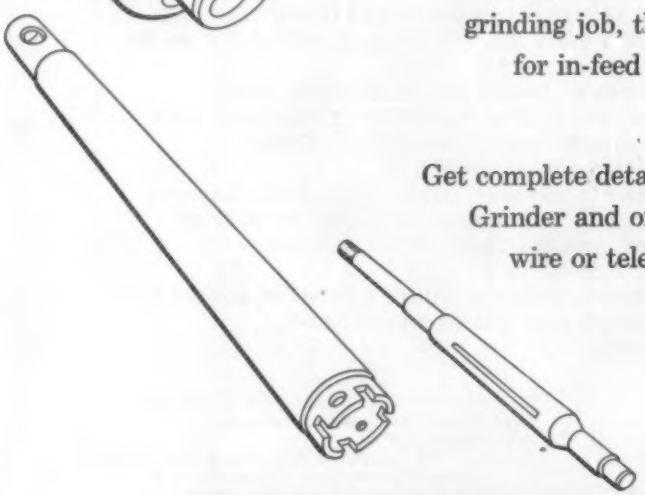
# Precision Grind Like These...

## Economically, Rapidly, To Close Tolerances

**with the new Van Norman 2C Centerless Grinder**

This rugged Van Norman 2C centerless actually gives you the workability of three centerless grinders with a minimum of changeover time. Featuring a 15 HP main drive motor which gives you enough HP for every grinding job, the 2C is equipped for thru-feed work, for in-feed and, with crush dressing attachment, form grinding and profile work.

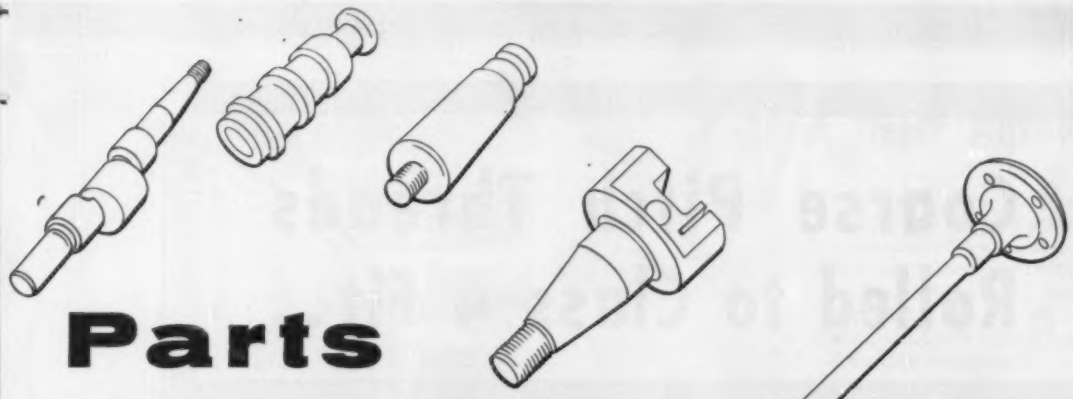
Get complete details on the Van Norman 2C Centerless Grinder and on other Van Norman grinders. Write, wire or telephone today for descriptive catalogs.



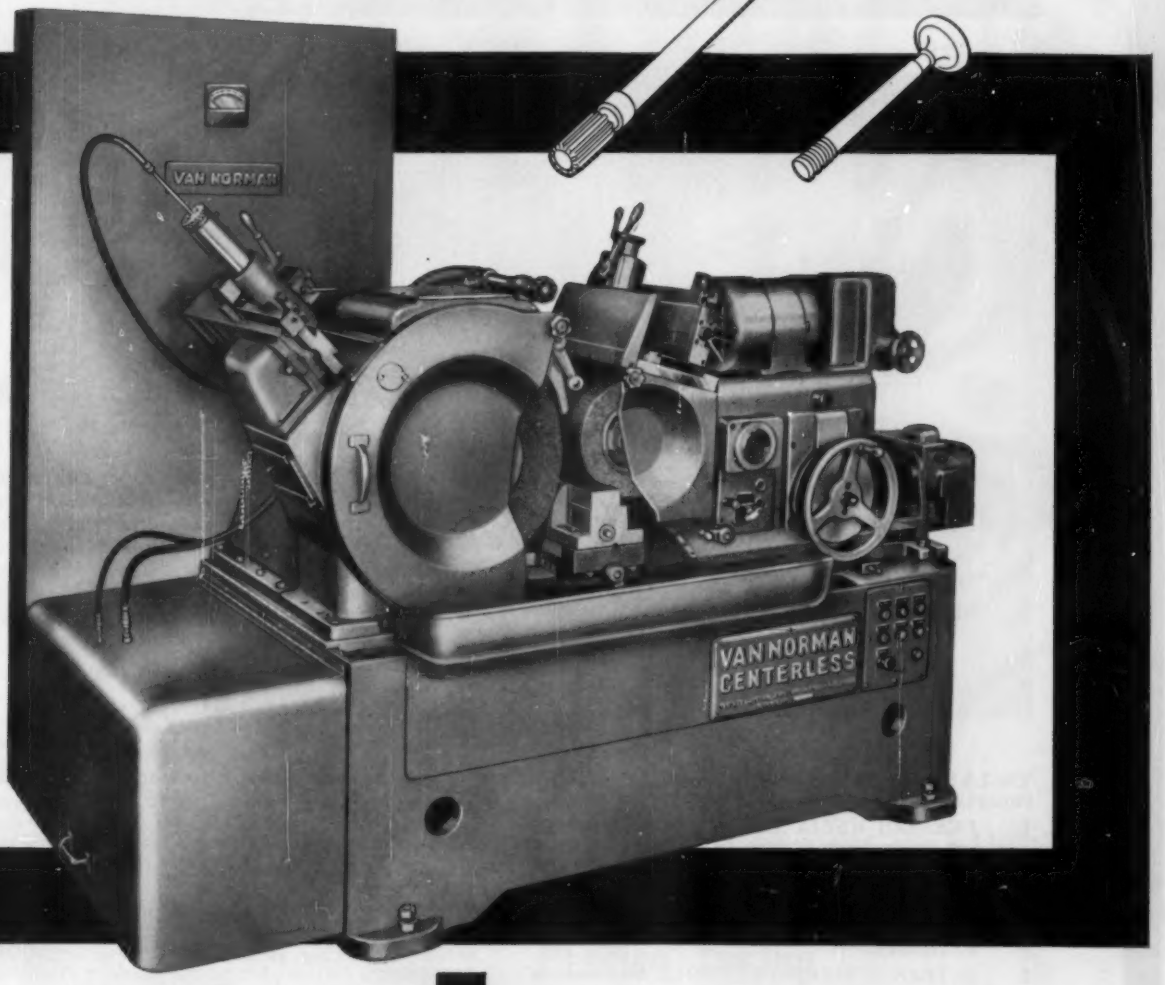
## VAN NORMAN MACHINE

*A DIVISION OF VAN NORMAN INDUSTRIES, INC.*

**MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.**



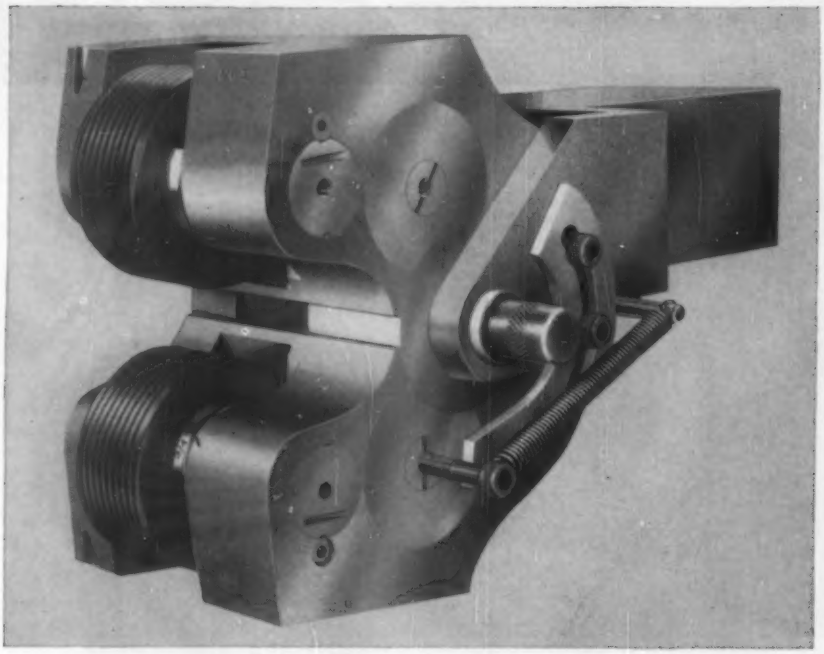
# Parts




**COMPANY**
**SPRINGFIELD 7, MASSACHUSETTS**

*Don't wait . . . for extra profits install a Van Norman machine now! They're available on many purchase plans . . . outright sale . . . purchase on conditional sales contract up to five years . . . pay as you depreciate up to 10 years . . . conditional sales contracts not available to Export.*

# Coarse Pitch Threads Rolled to Class 4 Fit..



The LANROLL Thread Rolling Attachments offer features designed to ensure greater accuracy, flexibility and economy when producing threads. . . .

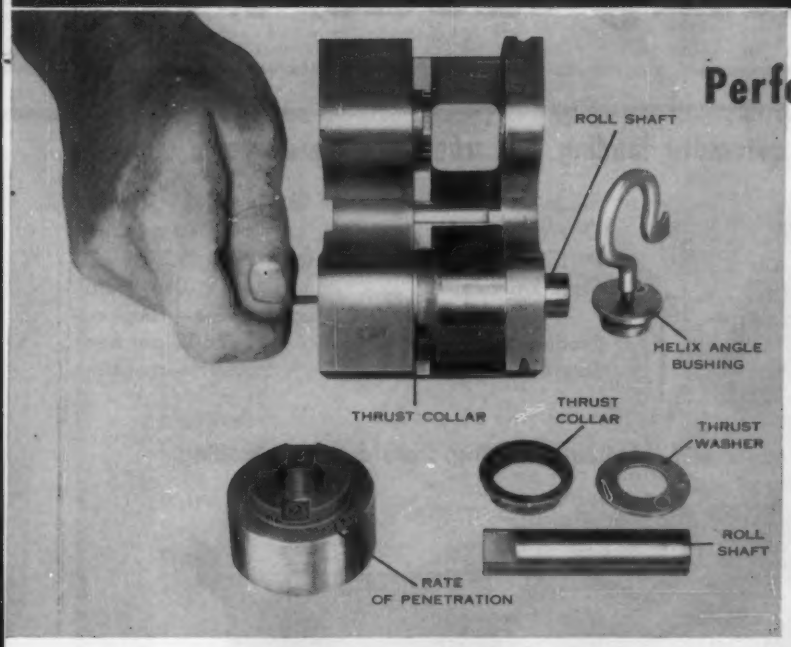
1. *PERFECT HELIX AGREEMENT* allows rolling coarse pitch threads to Class 4 tolerances with long roll life. Threads can also be rolled directly to a shoulder with safety.
2. *ADJUSTABLE DESIGN* provides wide range coverage for each attachment size without loss of rigidity.
3. *SUITABLE SIZES* of LANROLL Attachments have been designed for all types and sizes of automatic screw machines and turret lathes with power feed.
4. *RAPID AND PRECISE SET-UPS* are possible with special gaging methods designed for easy use and the elimination of "cut-and-try" set-ups.
5. Five sizes of Attachments roll a wide range of threads:
   #14—#5 to ⅜"; #18—#5 to ½"; #20—⅜" to 1"
   #22—⅝" to 1¼"; #24—¾" to 1¾"

Other outstanding advantages of these LANROLL Attachments include: behind-the-shoulder threading; taper correction; and excellent thread finish and microstructure. For additional information ask for Bulletin G-96—please send specifications when writing.

**LANDIS *Machine* COMPANY**

WAYNESBORO • PENNSYLVANIA • U. S. A.

423-c

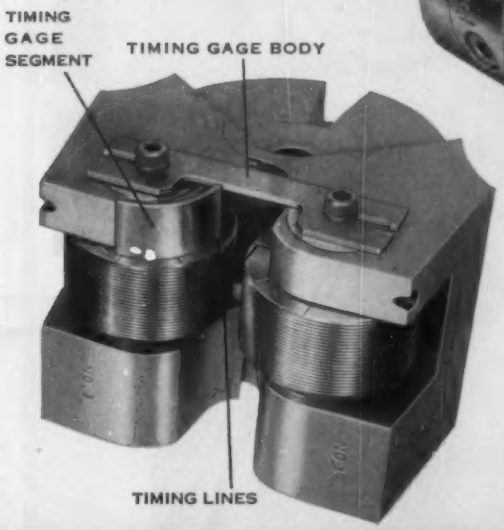



## Perfect Helix Agreement

The helix angle bushings, thrust collars, and thrust washers provide a corrective between the workpiece and roll helixes, eliminating drunkenness and ensuring coarse pitch threads to Class 4 fit. All helix angle equipment is designed and marked for rapid changes.

## Infinite Size Adjustment

Size adjustment links are used for major adjustments, with final sizing controlled by size adjusting screws. This system, and changing helix angle bushings, assures rolling all threads as though the attachment were exclusively engineered for that particular work.




## Precise Timing

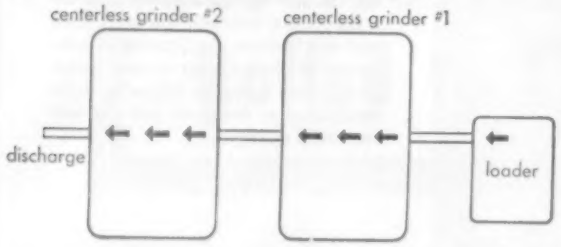
A simplified system of roll timing ensures satisfactory rolling on the first operation. Only one gage is used for timing all threads rolled by each attachment. Rolls are correctly timed when roll lines coincide with the vertical of the curved timing gage segment (illustrated).



# Landis Centerless grinders

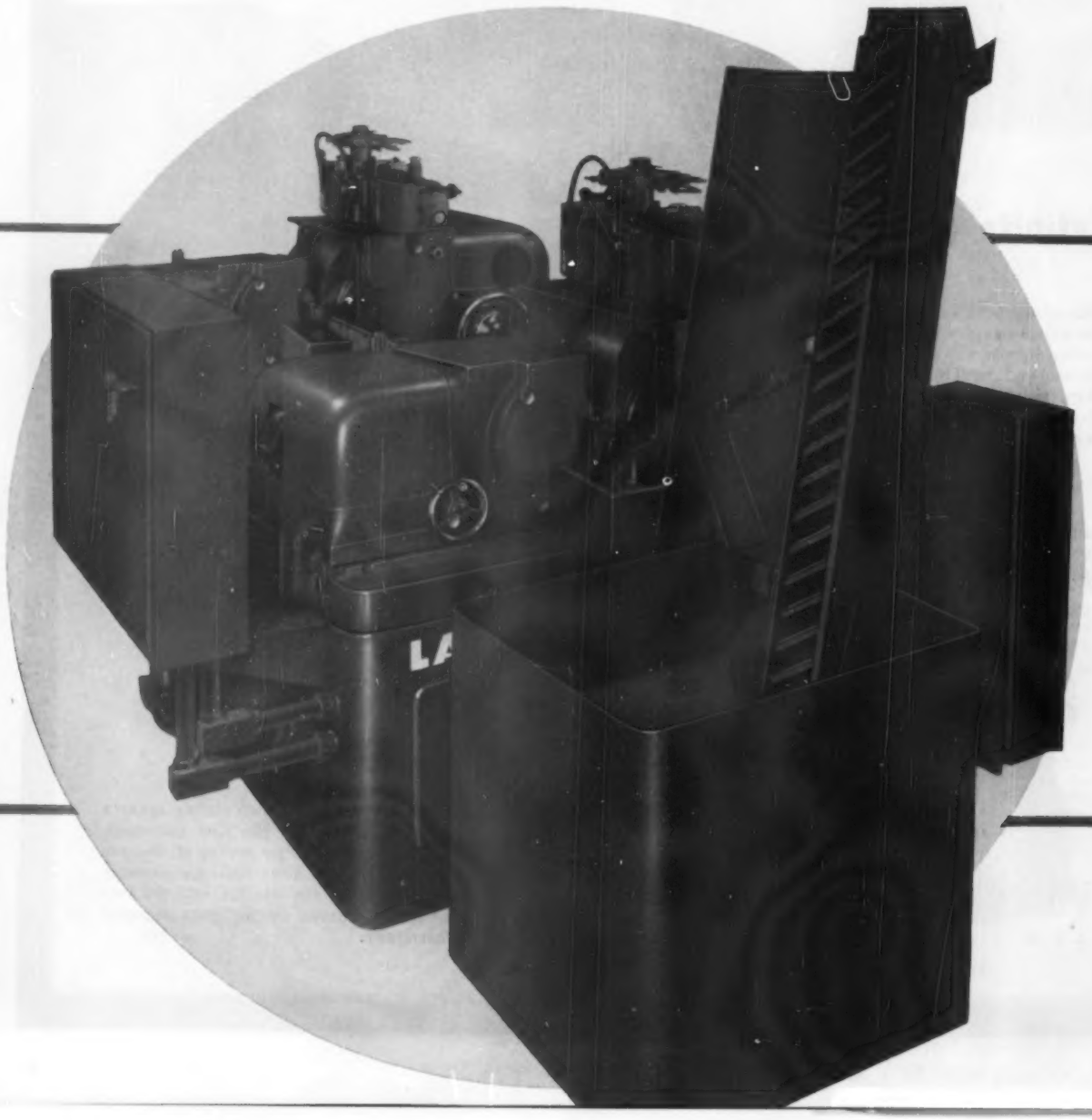
# 3 cost cutting ideas with

## ❶ 2600 pieces per hour with automatic loading and transfer of small parts




Machines . . . Two Landis No. 12 Centerless Grinders
Operation . . . . . Thrufeed grinding
Part . . . . . Pinion gear pins, 3/8" x 1 1/8"
Stock Removal . . . . . .016" total
.008" each machine—roughing
Production . . . . . 2600 per hour
Tolerance . . . . . .001"—roughing

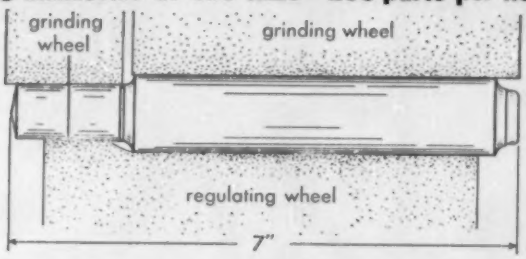
Two Landis No. 12 Centerless Grinders with automatic loading, transfer and unloading.



# BORE! DRILL! MILL!

# Landis Centerless grinders

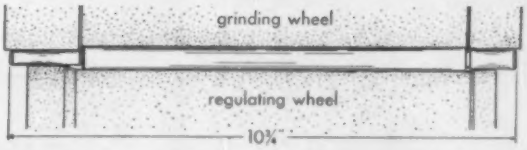
## ② 3 diameters at one time—266 parts per hour, automatically

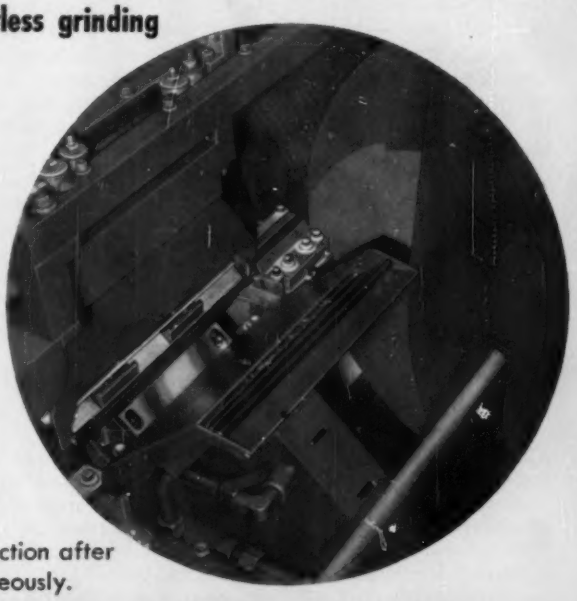


Machine.....Landis No. 12 Centerless Grinder
Operation.....Rough grinding 3 diameters at one time
Part.....Steering gear worm
Stock Removal.....010" from each diameter
Production.....266 parts per hour
Tolerance.....001"—roughing

Steering gear worm in carrier ready to be transferred to grinding position.

## ③ automatic loader speeds 3-diameter centerless grinding



Machine.....Landis No. 12½ Centerless Grinder
Operation.....Grinding 3 diameters at one time
Part.....Distributor shaft
Stock Removal.....006" roughing
.005" semi-finish
.001" finishing
Production.....320 roughing
320 semi-finish
350 finishing
Tolerance.....0005"

Distributor shaft ready for ejection after grinding 3 diameters simultaneously.

**LANDIS**
precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

## Giddings & Lewis Horizontals make

# BORE! DRILL! MILL!

- ***Extreme overall machine rigidity***
- ***Broad working range***
- ***Unequalled machining versatility***

**...plus G & L exclusive design advantages make 30 Series table-type Horizontals your best buy**

REMARKABLE ease and speed in centralized operation . . positive, foolproof mechanical control . . outstanding machine rigidity for any rough or precision boring job within their capacity! That's what you get with versatile Giddings & Lewis 30 Series table-type Horizontal boring, drilling and milling machines.

Because these Horizontals can bore, drill, mill, tap, ream, counter-bore — do so *many jobs* in fewer setups, they are one of the most profitable machine investments you can make.

For maximum boring accuracy requiring saddle feed, a 40 to 1 gear reduction to the saddle motion provides 18 additional feeds (.0125" to .625" per minute) for every spindle speed. Other features include convenient turnstile-mounted depth gauge for control of spindle travel — manual spindle reverse for tapping.

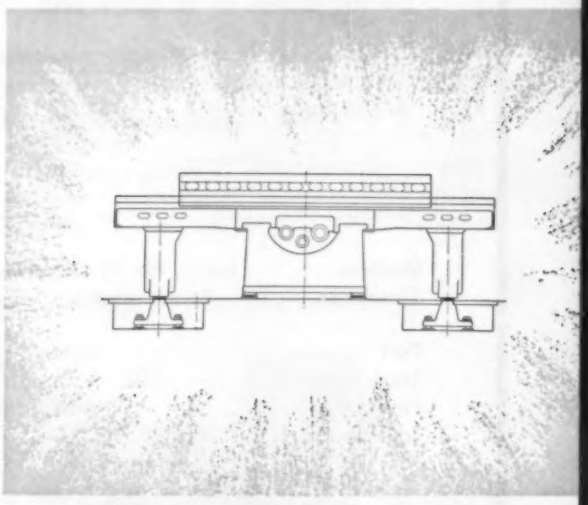
Machine handles equally well both stub and line boring operations. G&L enclosed end support maintains long boring bars with heavy tools in accurate alignment. Movements of end support bearing block and headstock are perfectly synchronized, with identical ground lead screws.

Highlighting G&L machine rigidity is 4-point, full-length headstock gibbing and self-equalizing clamps. This design creates maximum rigidity for travel and positioning anywhere on heavy, square column ways.

Further 30 Series table-type Horizontal machine specifications are offered in Catalog No. 30-T. Get your copy from your nearest G&L representative or write direct.

## G&L attachments and accessories that extend machining possibilities and profits

The world's broadest line increases scope of operations for 30 Series table-type Horizontals. It includes: plain, hand or power feed rotary tables; continuous feed facing head; angular milling attachments; and a complete line of Davis tools, arbors and sleeves. *Optional arrangements:* automatic electric positioning and improved measuring devices, pick-off gears for thread leads, built-in precision lead device and Dupli-Tracer electronic contour and profiling system.



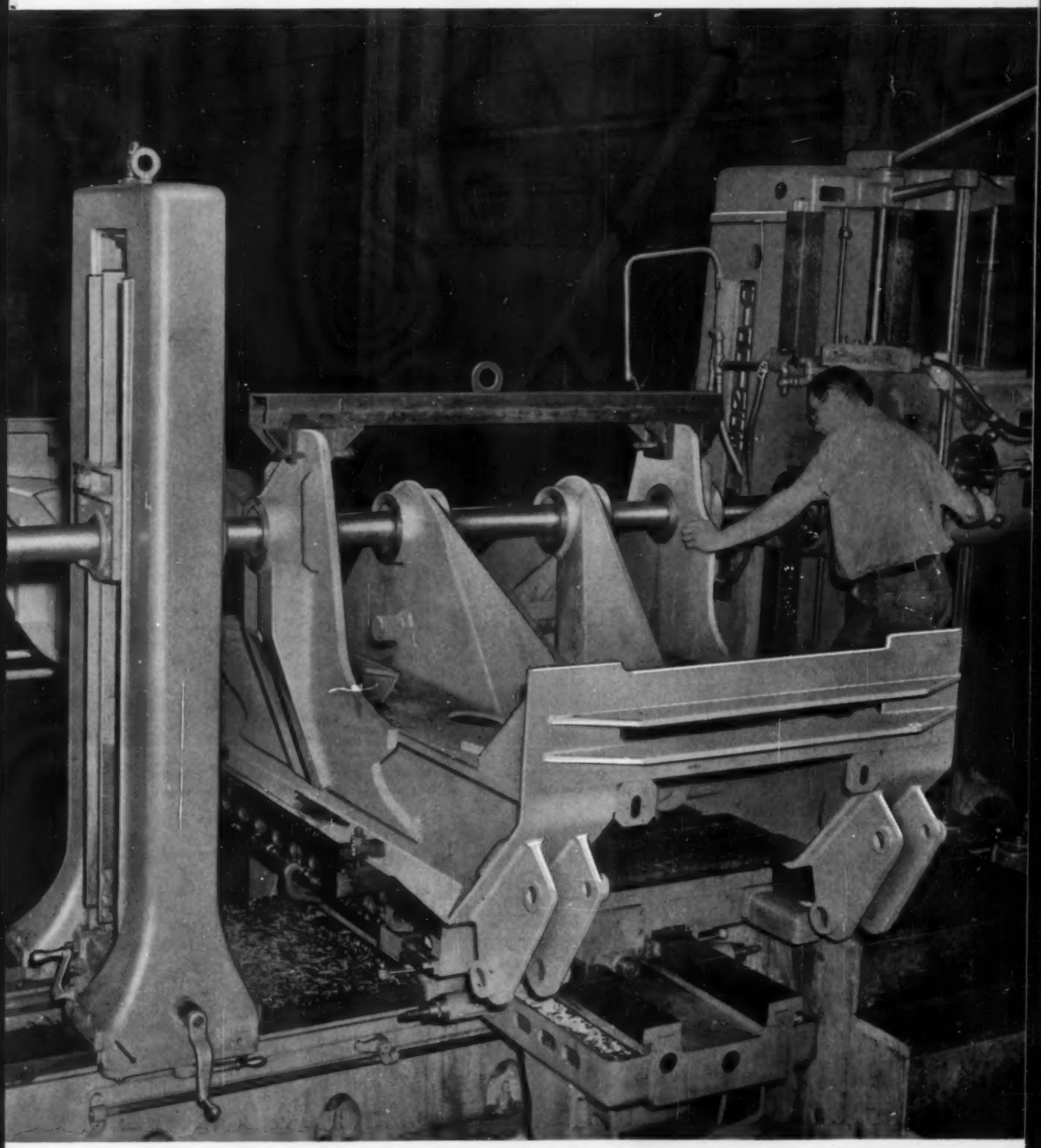
**Exclusive G&L extended saddle and saddle supports** (optional) — for precision machining of large workpieces. Diagram illustrates how table and saddle are *fully supported* even at their extreme positions. Used where greatest accuracy is required in progressive machining on different parts of workpiece.

The 30 Series line of Horizontals include the Model 350-T with 5" dia. spindle (25 hp) and Model 340-T with 4" dia. spindle (20 hp.) Both machines offer a broad choice of headstock, table and saddle travel. Other horizontal boring machines are offered in spindle diameters ranging from 3" to 14" . . . main motor drive 10-150 hp.

**G & L *and* HYPRO DIVISION**
**GIDDINGS & LEWIS MACHINE TOOL CO.**
FOND DU LAC, WISCONSIN G-86

*Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Profile Milling Machines.*

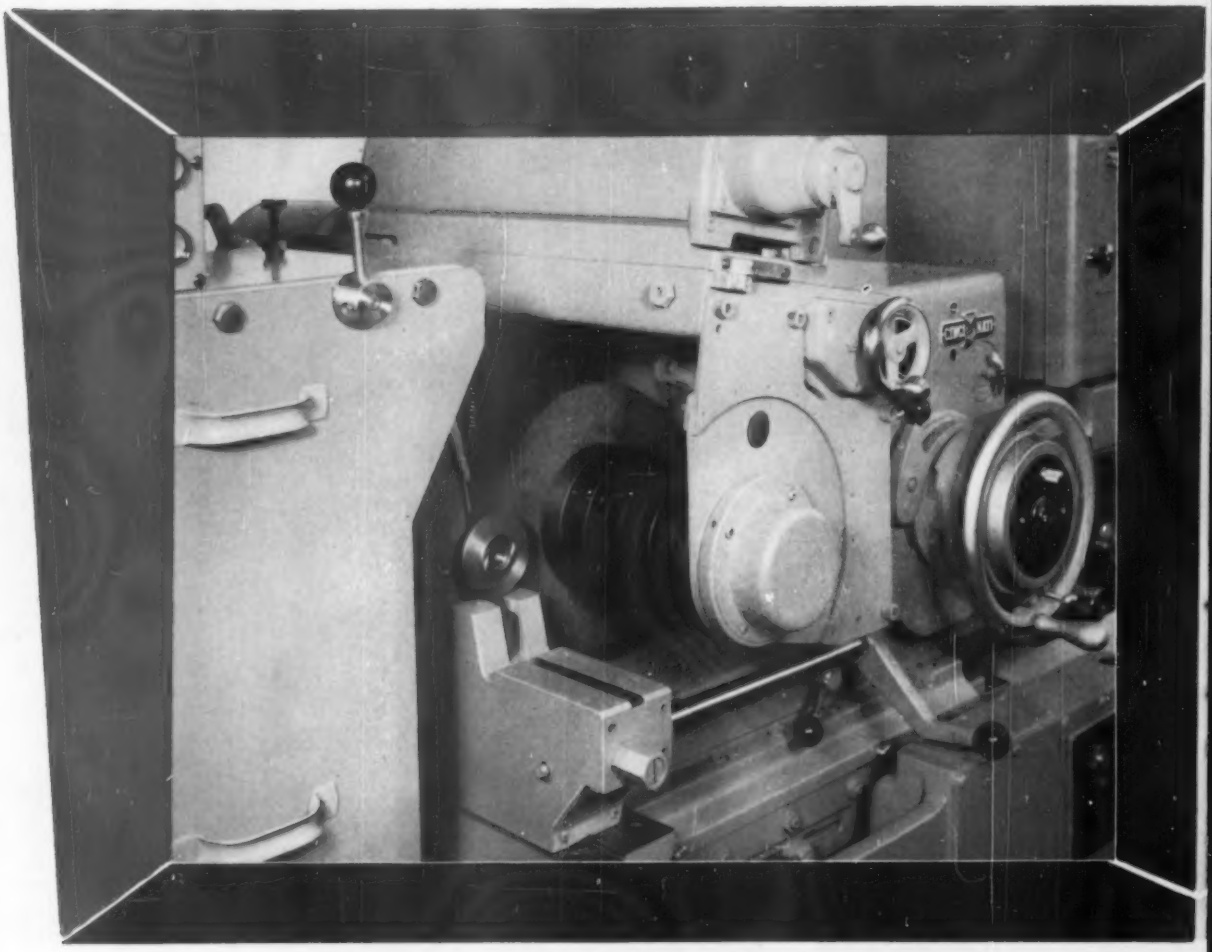
# Giddings & Lewis Horizontals make multiple machining operations pay off



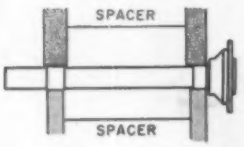
This 30 Series table-type Horizontal boring, drilling and milling machine performs rough, semi-finish and finish-precision boring of rear-axle, tandem-drive assembly for an earthmover component.

*Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Profile Milling Machines.*

# Nonproductive Chores



**Several automatic features incorporated in this CINCINNATI FILMATIC No. 2 Centerless Grinder reduce nonproductive time in centerless grinding two diameters on turbine shafts.**




Drawing of part showing diameters ground.

**Production Data:**

| | |
|---|---|
| *Part name* | Turbine shaft |
| *Material* | Steel |
| *Stock removal* | .010" |
| *Production* | 150 parts per hour |

# CINCINNATI

**CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE**

# are Automatic

# on this Cincinnati Centerless

Give the operator an assist with nonproductive chores and he'll accomplish more. One way to do it is to *automate* as many nonproductive elements as possible in the cost of machining. Cincinnati grinding specialists proceeded along these lines in equipping a CINCINNATI® FILMATIC No. 2 Centerless to grind two diameters on turbine shafts. The diameters are spaced several inches apart, requiring a two-wheel setup with an intermediate spacer, as shown in the drawing on the left-hand page. Automatic features for reducing nonproductive time include:

* **Automatic profile truing for grinding wheel, including cycle counter**
* **Automatic grinding wheel balancing**
* **Automatic grinding wheel reciprocating, automatically stopped while truing**
* **Automatic Electro-Hydraulic Infeed**

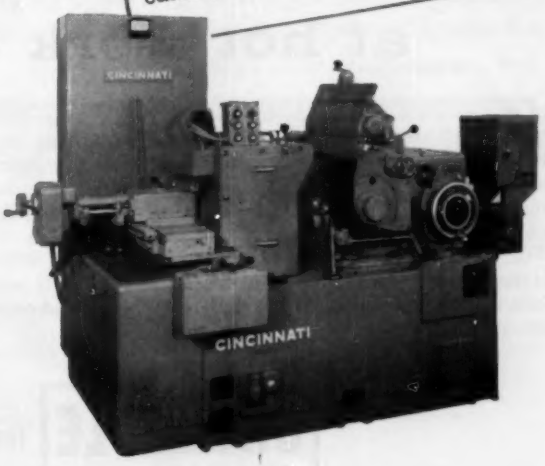
These cost-reducing features are in addition to well-known Cincinnati advantages such as bedrock mounting of grinding wheel spindle; FILMATIC grinding wheel spindle bearings; double slide support for the regulating wheel unit; anti-friction bearing ways for the infeed slide. CINCINNATI is unquestionably the best buy for your precision centerless grinding work. Get additional details by asking for catalog No. G-644-2, or look in Sweet's Machine Tool File for brief specifications on the entire CINCINNATI FILMATIC Centerless line: Nos. 1, 2, 3, 4, 5 and 6; 7½ to 75 hp.

**CINCINNATI GRINDERS INCORPORATED**

**CINCINNATI 9, OHIO**

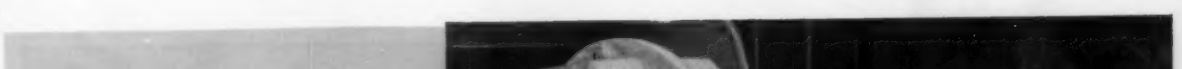
*extra equipment

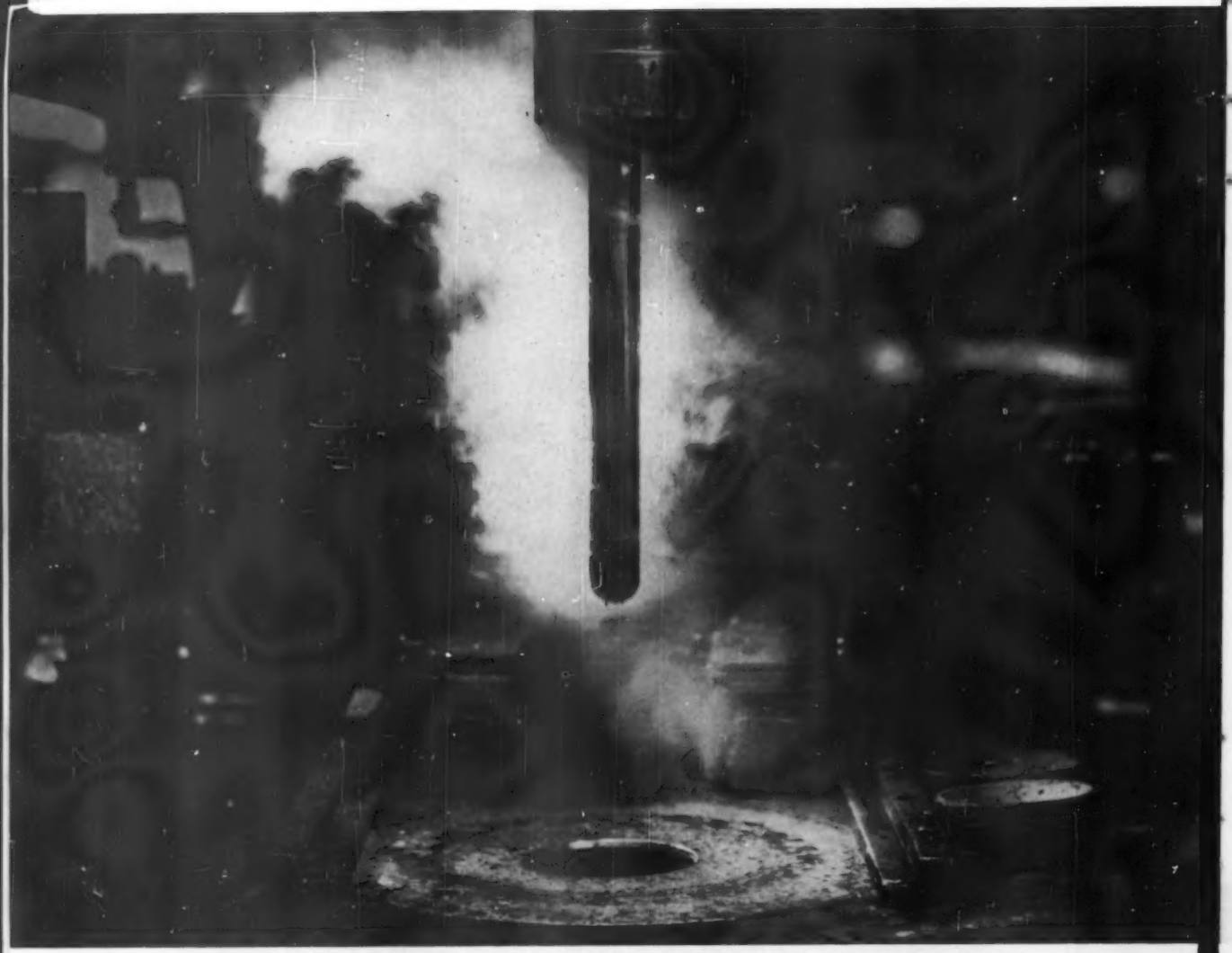
**CINCINNATI FILMATIC No. 2 CENTERLESS GRINDER**
with extra equipment for the automatic grinding operation described above. Complete information on the standard machine in catalog No. G-644-3.




**GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES**







Tough 2½" diameter mandrel at Rc 44 on 1150 ton brass extrusion press. Scovill Manufacturing Co.

# Mandrel of HALCOMB 218 retains toughness and hardness at hot work temperatures...

This mandrel is made of Halcomb 218—a tough, air-hardening hot work steel. Halcomb 218 is suitable for tools like this which require a higher degree of toughness at moderately elevated temperatures than is obtainable with the tungsten types of hot work steels. And Halcomb 218 *retains both* its hardness and strength at these temperatures.

For example, at a hardness of Rc 44, Halcomb 218's Charpy Impact Strength is 33 ft-lbs at 500F. And it will retain this hardness after 1 hour, after 10 hours and even after 100 hours at temperatures up to 900F.

Properties like these cut tooling costs. The mandrel shown above is good for 1200 pushes, for example, and even then all it needs, usually, is repolishing before being used again.

Halcomb 218 is particularly useful for all hot work operations on which drastic coolants are used. It even resists breaking very successfully when water cooled in operation. If these sound like advantages you can use, call your local Crucible representative for more complete data. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE** first name in special purpose steels

## Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

**Four Different TUMBLEX* Abrasives** assure best possible results in barrel finishing. TUMBLEX "A", most popular for general needs, removes flash, scale, burrs and tool marks, while forming radii and finishes to required microinches. TUMBLEX "T" is bonded, triangular and fast-cutting for special intricate parts, and won't wedge in work slots or holes. TUMBLEX "S", exceptionally dense and long lasting, is bonded spheres that get into areas where other shapes won't reach. "A", "T" and "S" are all made of famous ALUNDUM* (aluminum oxide) abrasive. TUMBLEX "N" is natural stones, exclusively Norton, of rounded shapes that bring up high lustre, especially on die castings and soft metals.

*HERE'S HOW TO*

# Choose the best abrasive for any metal finishing job

**Better Polishing With Every Set-Up** — wheels or belts — is easy when you standardize on Norton ALUNDUM abrasive grain. All types are extremely hard and tough, uniform in size, structure and chemical composition and have high capillarity for easy wetting. Type "S", sizes 14 to 90 grit and Type "R", sizes 100 to 240 grit, are noted for fast cutting and the satin finish which they produce. Type "B", sizes 20 to 600 grit, is an all-purpose, blocky, durable grain capable of producing fine finishes.

**Fast Cut.** Norton ARROW-BLAST* aluminum oxide grain cuts faster than natural abrasives and reduces dust on pressure blasting jobs to minimum. And remember, the less dust in any environment, the longer your operators can work, and the more they'll finish — at lower cost.

## *Norton tumbling, polishing and blasting materials add "Touch of Gold" advantages to countless applications*

Your metal parts can range from tiny needles to hefty forgings. They may be simple or complicated, hard or soft. Whatever they require in polishing or finishing, you can get plenty of "Touch of Gold" benefits from the wide range of Norton abrasives. Find out how. Ask your Norton Distributor for the illustrative, instructive booklets on barrel-finishing, metal polishing, or both. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries G336

NORTON
ABRASIVES
*Making better products . . . to make your products better*

**NORTON PRODUCTS**
Abrasives • Grinding Wheels • Grinding Machines • Refractories

**BEHR-MANNING DIVISION**
Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

# "We specified Westinghouse components to get more production from this machine tool"

Trends to greater precision and higher operating speeds for machine-tools make components selection a critical decision.

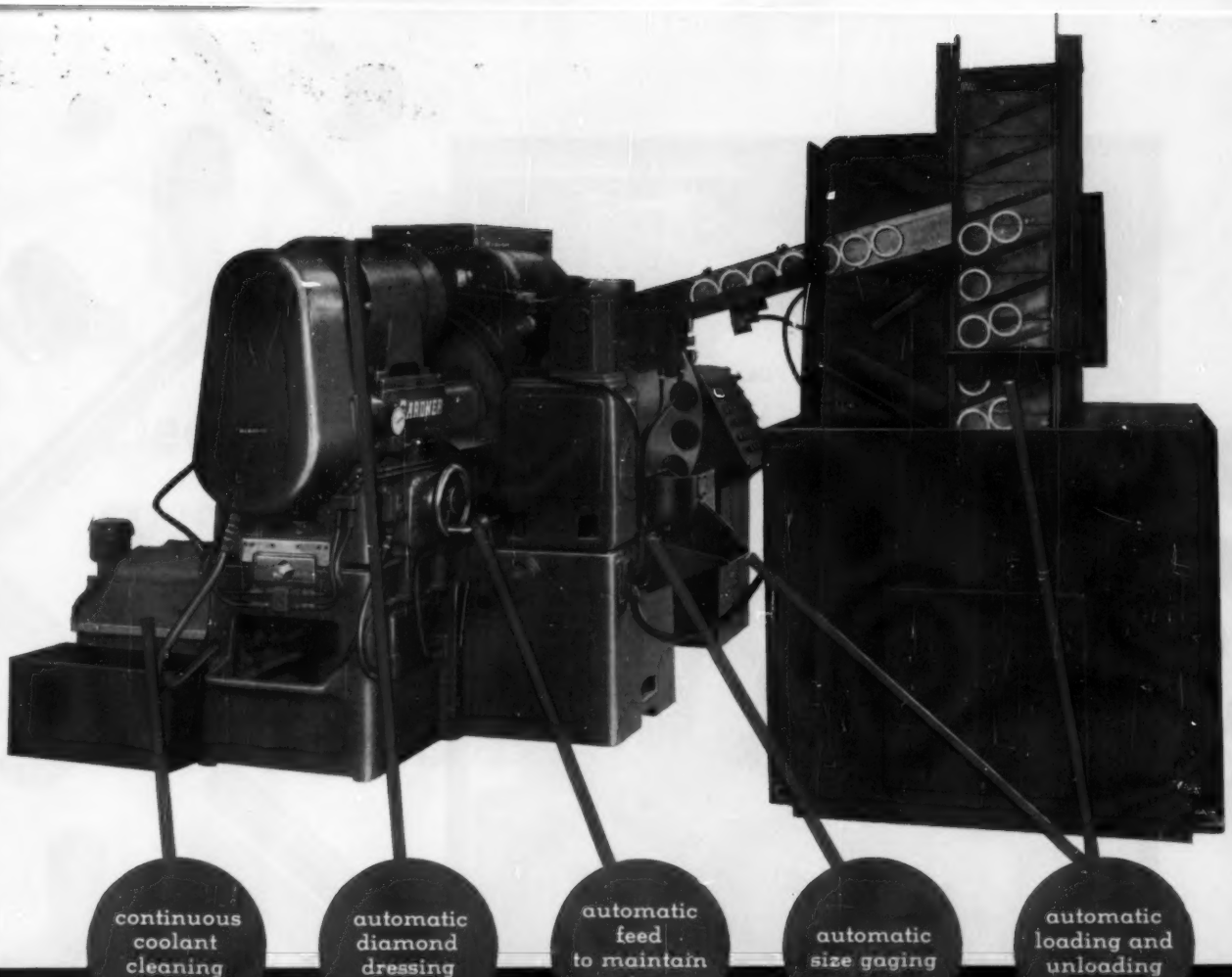
Westinghouse components are built to deliver all the outstanding performance the machine-tool designer intended. Their long, dependable service life assures high machine-tool availability for accelerated, continuous production.

Westinghouse ability to understand, supply and service machine-tool needs is based on 40 years' firsthand experience in serving the machine-tool industry. Choose Westinghouse components to bring out the best in your machine tools. J-96107

***Specify these Westinghouse components when you buy machine tools:***
Motors • Controls • Pushbuttons • Gearmotors • Speed Reducers • Adjustable-Speed Drives • Semiconductors • Cypak* Static Control • Rectifiers • Magamp* Magnetic Amplifiers • Instruments • Relays • Machine-Tool Transformers • DYNAC® Magnetic Braking.

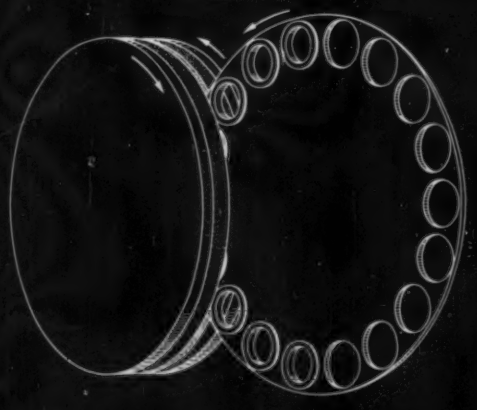
*Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse




# Automatic features increase productivity and maintain consistent accuracy

**2H30 grinds TWO parallel sides of pump gear in ONE operation**



**production data**

| | |
|---|---|
| Grinding: | 2 parallel sides of 4″ pump gears |
| Rate: | 600 parts per hour |
| Stock Removal: | .015″ maximum overall (semi-finish) |
| | .010″ maximum overall (finish) |
| Tolerances: | .0005″ parallelism |
| | .002″ uniformity |

# GARDNER

**precision disc grinders**

BELOIT, WISCONSIN

PARTS SHOWN ACTUAL SIZE

YOU CAN PRODUCE IT BETTER,

# Electro-Cycle® Turret Lathe's flexibility speeds small intricate parts production

**By switching from a conventional hand turret lathe to a Warner & Swasey Electro-Cycle, Heat Timer Corporation, New York City, manufacturer of heat control devices, is now able to produce a wide variety of parts like these in 100 to 5,000-piece lots—work that formerly was subcontracted.**

Heat Timer's basic production problem is one of machine flexibility on small lots. Their product line's wide diversity in a very competitive market necessitates a tight control on inventory. That's because they usually run just a few parts for pilot models and custom-engineered standard units. In addition, larger runs are required for their production models. They tell us, "It's been most important in helping provide tight control over our price structure—keeping us competitive in today's market."

They especially like the Electro-Cycle's:

- **Ability to hold .001″ tolerances**
- **Extreme ease of job setup**
- **Precision control of all machine functions**
- **Ease and simplicity of operator training**

Our Field Engineering Staff will gladly show how Electro-Cycles can improve work quality and build increased profits for you. No obligation, of course. Why not call today?

® Reg. U. S. Pat. Off.

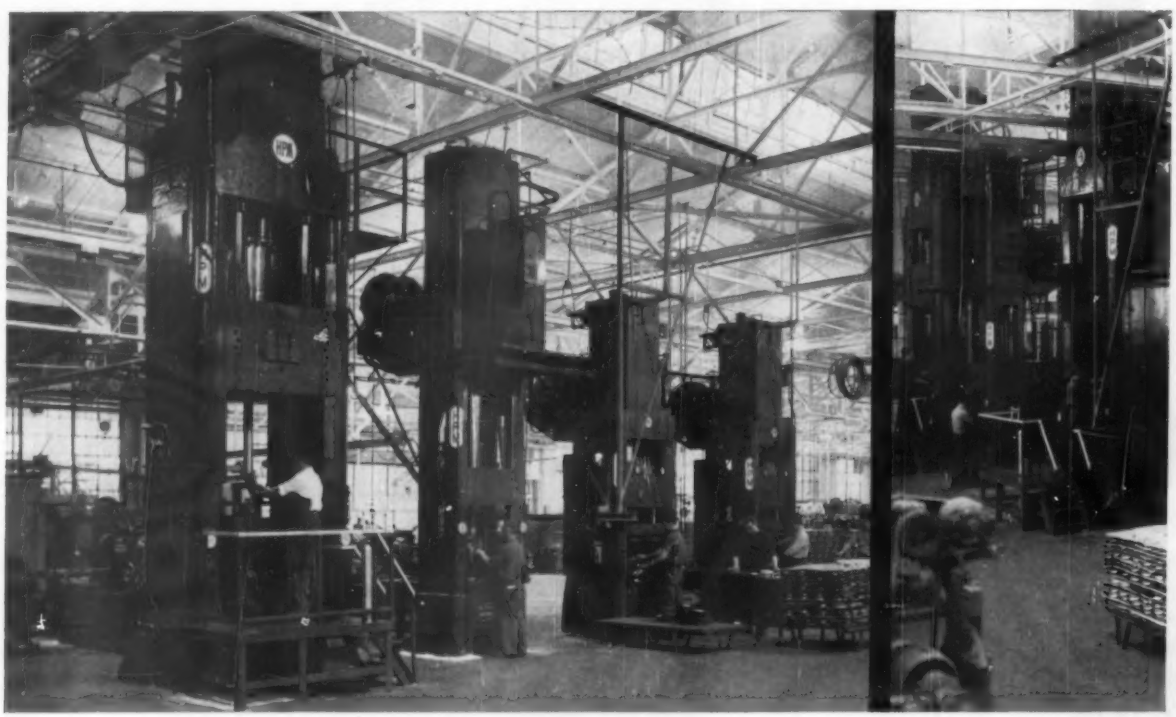
**FASTER, FOR LESS...WITH A WARNER & SWASEY**

WARNER & SWASEY
*Cleveland*
PRECISION MACHINERY SINCE 1880

# MORE H-P-Ms - IN MORE PLANTS

## BROADENED LINE DIVERSIFIES H-P-M SERVICE TO INDUSTRY

Back in the early thirties, Rome Manufacturing Company, Division of Revere Copper and Brass Incorporated, began using H-P-M hydraulic presses in the manufacture of their now famous Revere Ware utensil line. Since that time, over twenty more H-P-Ms have been added in Revere plants. Literally hundreds of different dies are interchangeably used for the drawing and forming of sheet metal into the many forms used in Revere kitchen utensils. Revere is typical of industries that have adapted the principles of hydraulics—H-P-M hydraulics—to numerous metal forming operations because of their versatility, ease of maintenance and control, the infinite adjustability of tonnage, stroke and speed of ram traverse. All of these adjustments are at the operator's fingertips. Press operation for automatic and semiautomatic requirements is a matter of simple adjustment.



The complete H-P-M line has been illustrated and described in Bulletin 5600 and covers equipment drawing with and without die cushions, coining, embossing, straightening, rubber pad forming, forging, hot forming and trimming, and a variety of presses for the processing industries. Your request on your letterhead will send it to you by return mail.

**THE HYDRAULIC**

**A DIVISION OF KOEHRING**

# -DOING MORE WORK

Adapting versatile H-P-Ms is a matter of tooling ingenuity and the application of experience your H-P-M field engineer will gladly supply. If your production facilities are undergoing modernization for the competitive days ahead, call in the H-P-M man in your area, or write to the home office in Mount Gilead, Ohio. Let the experience of our qualified engineers assist you at the planning stage.

Two different rows of H-P-M presses at Rome Manufacturing Company, Division of Revere Copper and Brass Incorporated, Rome, New York.

## HIGH SPEED WITH BUILT-IN ACCURACY ASSURANCE

### A story of H-P-M Henry & Wrights in the automotive industry

Here's a machine, one of ten designed for a large automotive manufacturer expressly for the progressive stamping of parts on high production. Double crank design supports crosshead at both ends for accuracy; underdrive operation gives a low center of gravity and a pulling rather than a pushing action. Here's a dieing machine for greater range of work with better quality control at top speeds. It's JIC designed, which means less maintenance, better service for any requirement. And it's now made by H-P-M—a leader in metalworking presses since 1877. Send for complete information today.

*Henry and Wright . . . built by H-P-M*

H801

# PRESS MFG. COMPANY

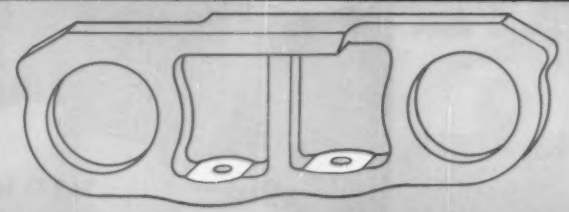
**COMPANY • MOUNT GILEAD, OHIO, U.S.A.**

## This job is a "natural" for broaching . . .

and the V-3 VERTICAL PULL-DOWN LAPOINTE

# BROACHING MACHINE

is so efficient that it pays its way
**although working only ⅓ of its available time!**



**Steel forgings are tough to machine,** but one of the world's largest producers of road-building equipment has substantially reduced production costs by Lapointe-Broaching the nut seats in steel-forged track links. Two 1¼" wide x 5/16" deep internal nut seats are broached in each link. Production is 170 complete links per hour, at 80% efficiency. And the interesting part of it all is that the investment in this Lapointe machine is paying off even though the broach *stands idle for two-thirds of the time!*

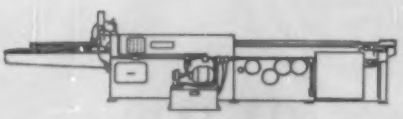
**There are good days ahead for production men** who use Lapointe-Broaching on all applications where broaching is practicable. Probably you'd be surprised to know how often it turns out that a difficult operation can be converted to Lapointe-Broaching from milling, shaping, etc., with an *improvement in quality, increased production . . . and lowered costs.* An experienced Lapointe Field Engineer will gladly discuss some of your tough machining problems with you. Quite possibly he can show you how to save some money.

**THE LAPOINTE MACHINE TOOL COMPANY**

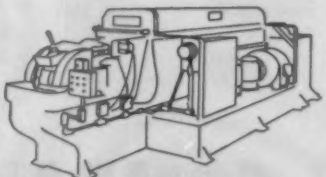
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

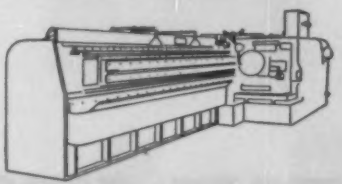
*Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE*



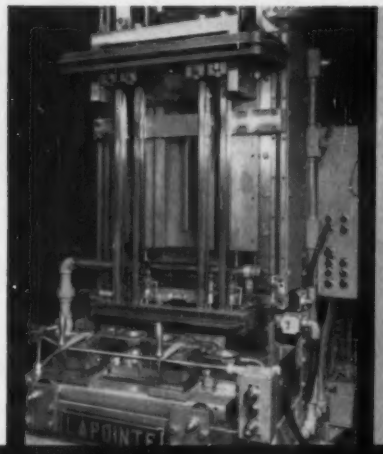
60" STROKE HORIZONTAL, ELECTRIC



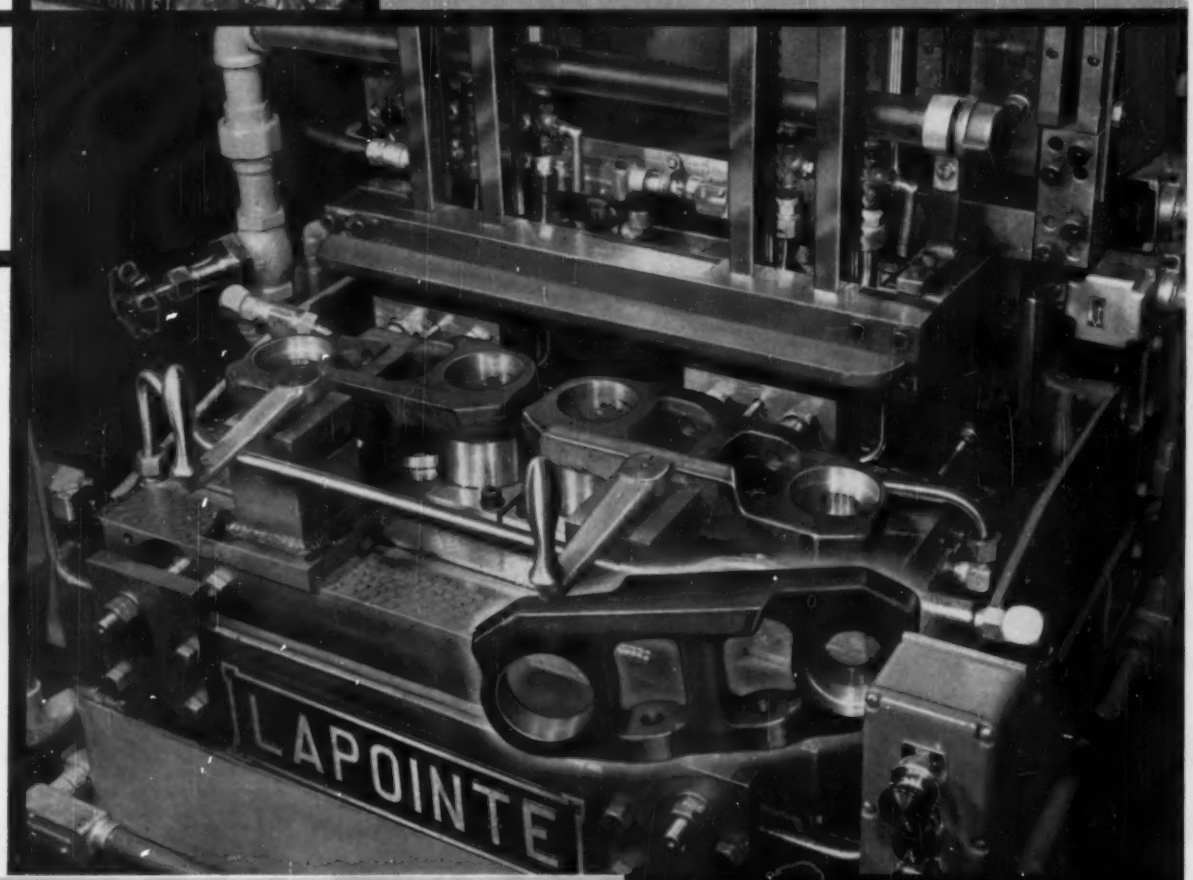
CH CONTINUOUS BROACHING, ELECTRIC

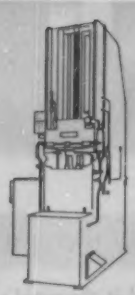


SRHE SINGLE RAM HORIZONTAL, ELECTRIC

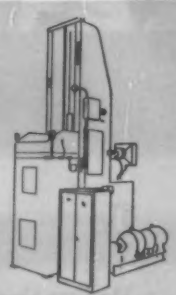


Accommodating one right-hand and one left-hand part for simultaneous broaching, this hydraulically operated drawer type Lapointe-built Broaching Fixture retracts for unloading and reloading during return of broaches.



VUE-7 VERTICAL PULL-UP ELECTRIC



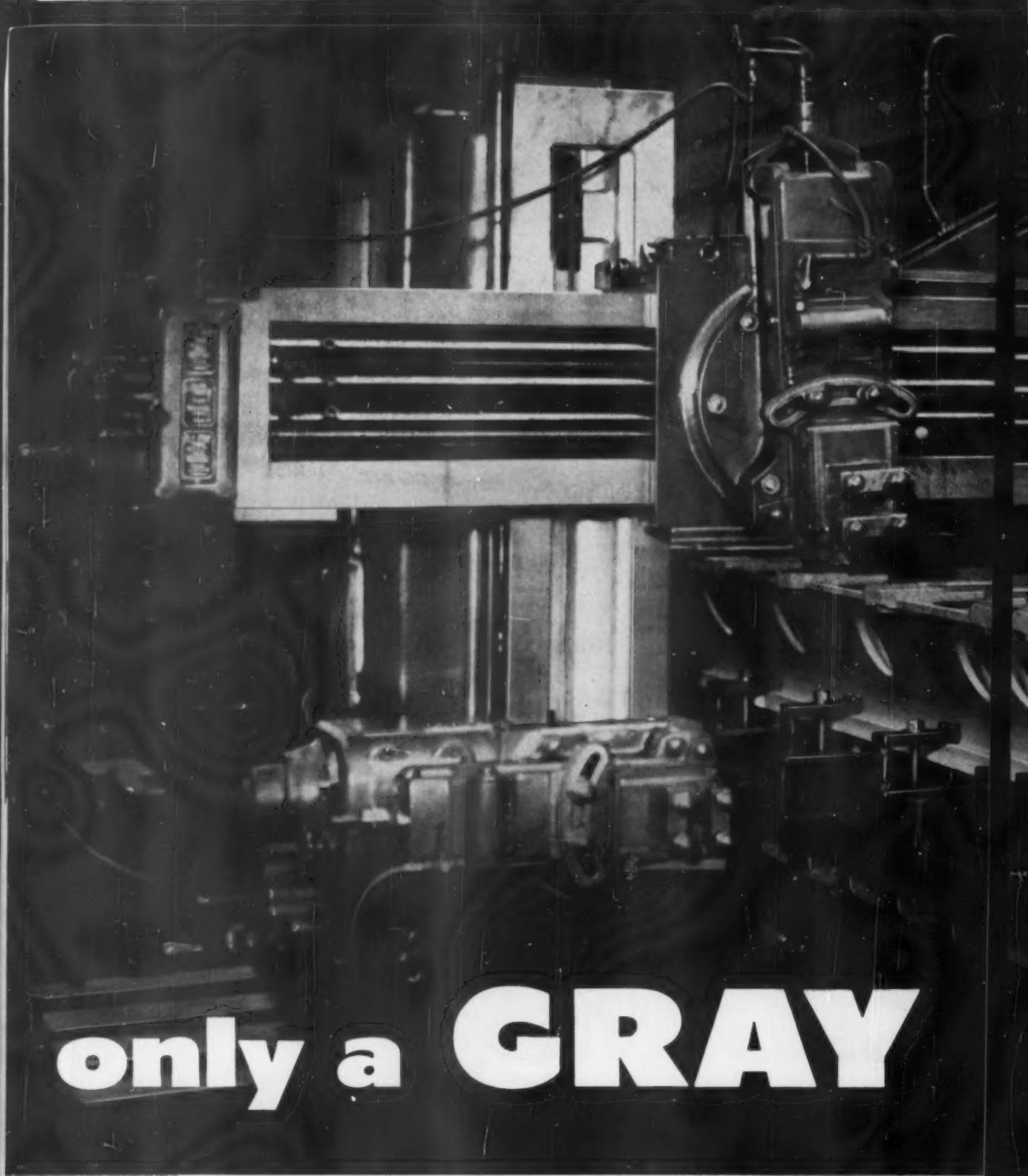
SRVE SINGLE RAM VERTICAL, ELECTRIC

DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING



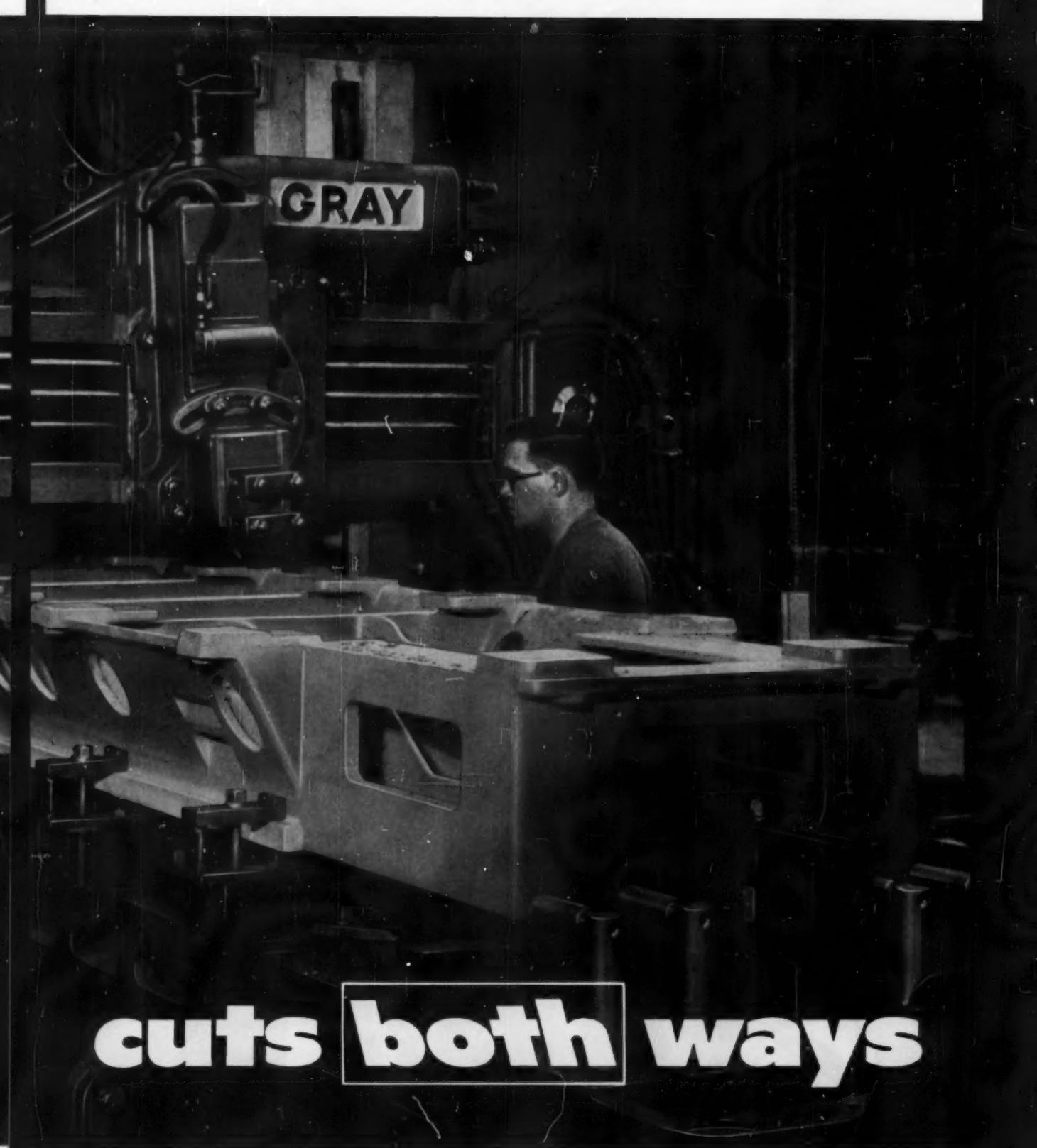
# only a GRAY

Cuts going—cuts coming . . . that's "double-cutting" with the GRAY Universal Planer. At Textile Machine Works, Reading, Pennsylvania, this new GRAY is pictured double-cut carbide planing a Tricot Machine Base. Former floor to floor time of 62 hours has been slashed to 12 hours by the enormous productive potential of the new GRAY that cuts both ways.

The G. A. GRAY Co., Cincinnati, Ohio.

**heavy-duty planing**

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.




# cuts both ways

### double-cutting

The flick of a lever, the touch of a button permits double-cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.

### triple-cutting

Rough and rough-finish plane at the same time. Rough by double-cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.

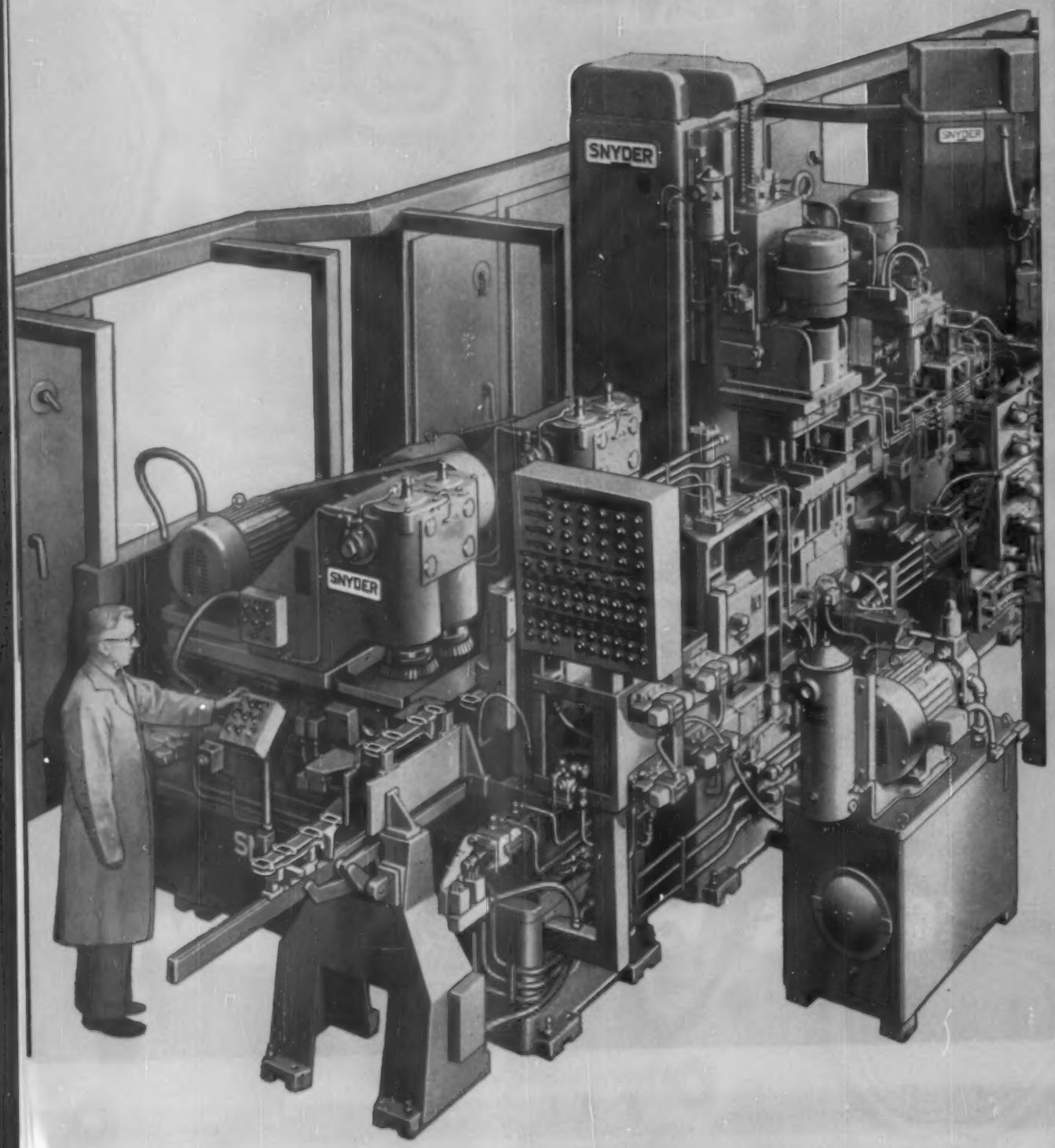
### cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

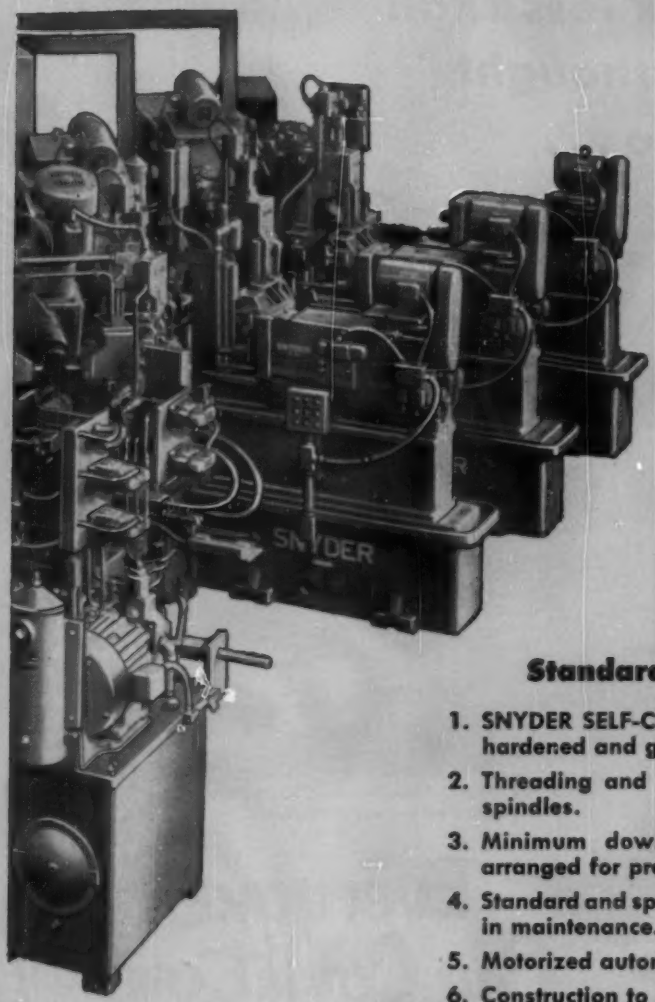
## Simultaneously in Random Sequence

The G. A. GRAY Co., Cincinnati, Ohio.

# Two Different Exhaust Manifolds Processed by Snyder Special



# Simultaneously in Random Sequence In-Line Transfer Machine




## SPECIAL FEATURES

1. Production: 136 manifolds per hour.
2. 28 Stations: Operations include milling, drilling, chamfering, probing and tapping.
3. Manifolds "A" and "B", loaded at random, are identified by built-in sensing devices which activate or idle machining units at appropriate stations as required by the different parts. Parts "A" and "B" are identically processed at Stations 1, 4, 6, 7, 8, 9. At Stations 6, 7 and 9, sensing devices detect Part "B" and bring in automatic clamp support. Both parts are turned over at Station 12. Part "A" is processed at Stations 14, 16, 17, 18, 19. Part "B" is processed at Stations 22, 24, 25, 26, 27 and both parts are unloaded at Station 28 by automation equipment.
4. Individual base segments provide maximum flexibility for future part design changes.
5. Floor space: 63′ x 20′.

## Standard Features of Snyder Machines

1. SNYDER SELF-CONTAINED UNITS and other units equipped with hardened and ground ways.
2. Threading and tap heads equipped with individual lead-screw spindles.
3. Minimum downtime for tool changes because spindles are arranged for pre-set cutting tools.
4. Standard and special parts interchangeable for speed and economy in maintenance.
5. Motorized automatic lubrication system for all moving parts.
6. Construction to J. I. C. Standards throughout.
7. Master Push Button Panel and Light Console at Station 1.
8. Each unit equipped with its own push button control station for ease of tool setup and manual operation of unit.
9. Electrical interlocks and full depth circuit throughout.
10. Panels equipped with SNYDER CIRCUIT SLEUTH.

# SNYDER

**TOOL & ENGINEERING COMPANY**

**3400 E. LAFAYETTE • DETROIT 7, MICHIGAN**

*32 Years of Special Machine Tools with Automation*

**Forethought costs less than Afterthought so . . .**

# Design These in When you Begin!

Series 1370 High Speed Counter (1500 to 2500 rpm) built into a wide variety of equipment.

If you need mechanical or electrical counters in any of your new products, here's a word to the cost-wise designer: *Design them in, when you begin . . . don't tack them on later.*

For if you'll give us a chance to work with you, right from the beginning, chances are we can save you time and money by adapting or modifying a *standard* Veeder-Root Counter to your needs . . where you might get into a costly special job if you went about it alone. What's more, you save time in your engineering, purchasing and assembly departments.

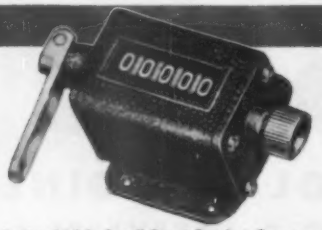
Count on Veeder-Root to help you in every way . . . from design to delivery. Write:

## Everyone... Can Count on Veeder-Root

INCORPORATED

Hartford, Conn. • Greenville, S. C. • Chicago
New York • Los Angeles • San Francisco • Montreal
*Offices and Agents in Principal Cities*

Series 1205 Reset Magnetic Counter with panel mount and lock and key.

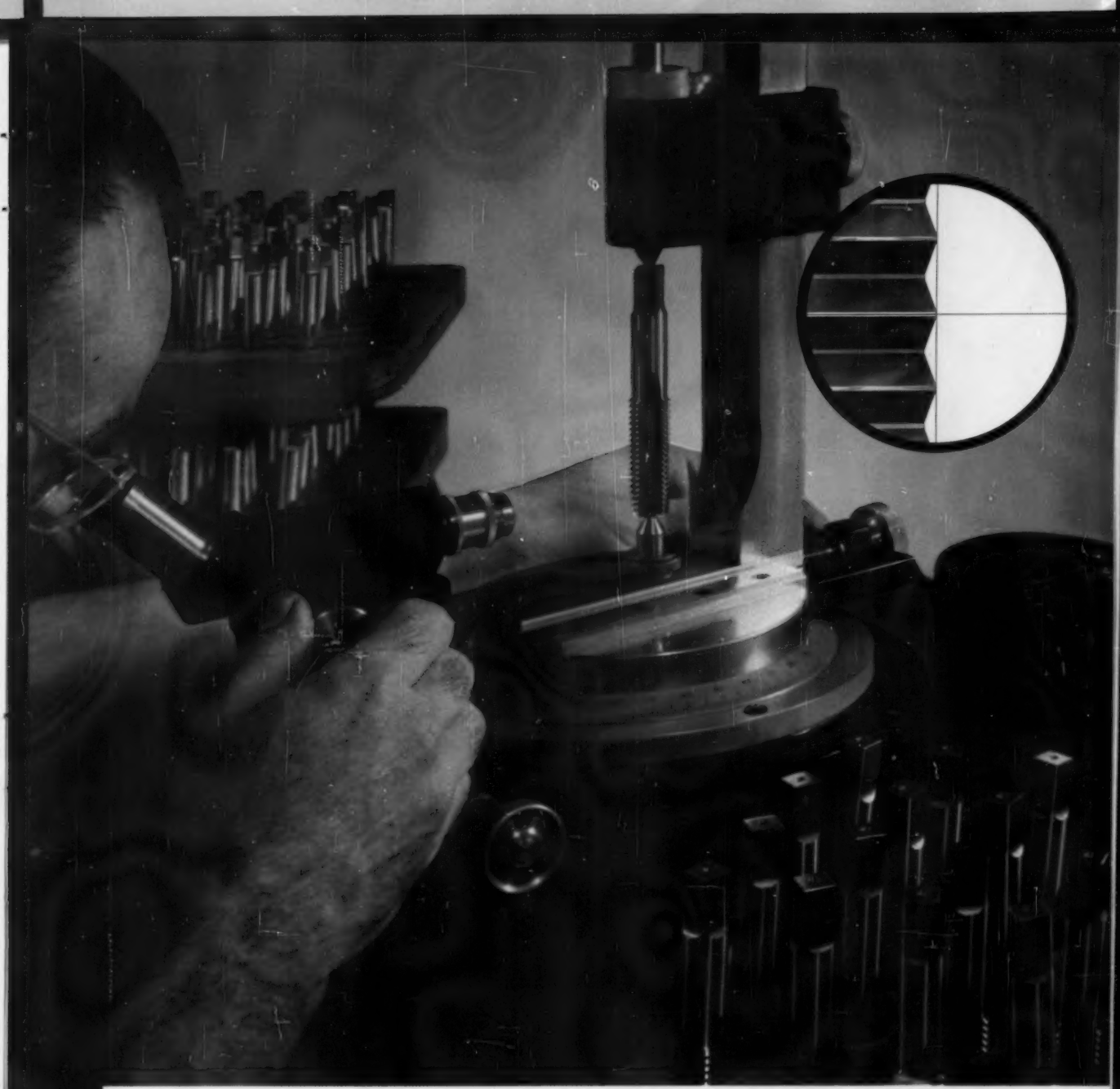


Series 1122 Small Reset Ratchet Counter.

Special Longitude Counter, one of many made for aircraft navigational equipment.




Making the best ... BETTER



Rake, or hook (curved rake), is an all important element in the cutting ability of a tap tooth. The angle required to cut tool steel will not do the same job on cast iron, or brass, or aluminum. For every material there is a best rake or hook angle.

Whether they are stock taps with standard rake or hook for general purpose tapping; special purpose stock taps for a specific material; or special taps, cutting angle could mean success or failure on the job.

"Greenfield's" quality control includes checking this vital element on equipment especially designed for the purpose.

**GREENFIELD** TAP and DIE CORP.
GREENFIELD, MASS.

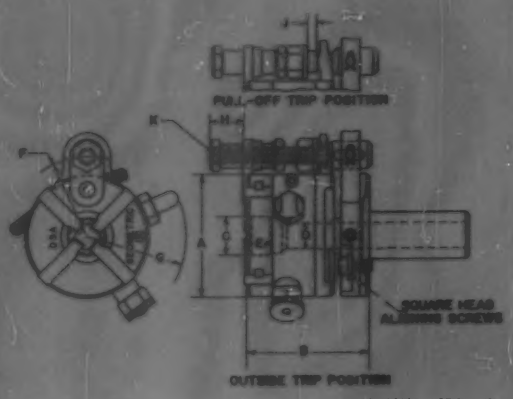
# Making the best...BETTER

GEO MET RIC

## NEW Geometric Convertible self-opening die head with aligning shank

1. Ease of assembly and disassembly.
2. Improved driving construction for freer and smoother operation.
3. Improved locking bolt and segment providing greater wear life.
4. Tongue and groove drive between cam spring plate and skeleton.
5. More rugged construction of small parts — new and heavier stop plunger, larger adjusting screws (Hollow Hex), heavier tripping mechanism, larger cam spring plate screws — without increase in size or weight of die head.
6. Flatted construction of backpart and shank (permitting the die head to be installed as close to the turret as possible without interference).
7. Better interchangeability of parts.
8. Present DS chasers interchange in New "DSA" Model.

STYLE DSA




There is no better Die Head available for use on Brown and Sharpe and other small screw machines of either the automatic or hand type than the NEW Geometric convertible self-opening style DSA Die Head.

The NEW DSA comes with an aligning shank which permits adjustment for machine misalignment. It is equipped, also, with both Outside Trip for short length, fine pitch shoulder threading and a Pull-Off Trip for threading lengths providing ample chaser engagement for tripping. Conversion from one trip to the other is quick and simple. The DSA is especially recommended for cutting fine pitch threads of short lengths.

An outstanding Die Head that is really rugged, requires minimum attention and is easier to adjust, the DSA now joins the Geometric family of the best in precision threading tools.

### SPECIFICATIONS — STYLE DSA *For the present the DSA is available in ¾" size*

| Style and Size Inches | MACHINE USED ON | CAPACITY Str. Threads Dia. | § Lgt. | Coarsest Pitch | Std. Pipe | Code Word | A | B | C | D | E | F | G | H | J | K | Standard Shanks† Dia. | Lgt. | Bore | Max. Shanks Without Bushings Dia. | Lgt. | Chasers | Net Wt. Std. Shk. for B. & S. Mach. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DSA ¾ | 00 and 00G-B. & S. Auto.<br>0-B. & S. Wire Feed & Hand<br>Cleveland S.S. | ⅛ to ⅝ | 1⅛ | 18 | None | Lesab<br>Lesac<br>Lesad<br>Lesae | 1⅜ | 1⅜ | 23/64 | 1½ | 1½ | 1⅛ | 1⅜ | Max. 1⅝ Min. ⅝ | Max. ⅛ Min. 0 | #12-28 N.F. | ⅝<br>¾<br>⅜<br>1⅛ | 1⅝<br>6<br>6<br>6 | 1½<br>Solid<br>Solid<br>Solid | ⅝<br>1⅛ | 1⅝<br>6 | 4 | 13 oz. |

§ Length that can be cut when shank is solid.
† Special Shanks furnished at extra cost.

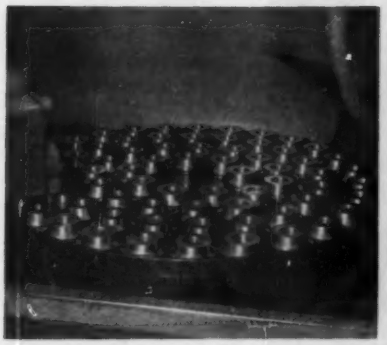
*WRITE TODAY FOR FURTHER INFORMATION OR SEE YOUR LOCAL INDUSTRIAL DISTRIBUTOR*

**GEOMETRIC TOOL COMPANY DIVISION**

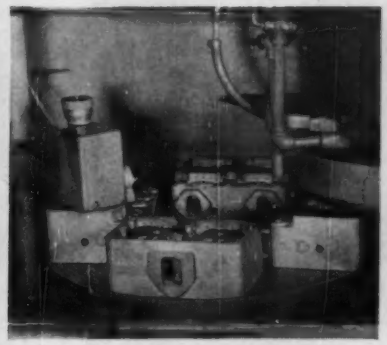
GREENFIELD TAP AND DIE CORPORATION

NEW HAVEN 15, CONNECTICUT

# Whatever your grinding job may be...



200 adjusting screw washers are ground on one side in one hour. Stock removal .025"; limits ± .001".

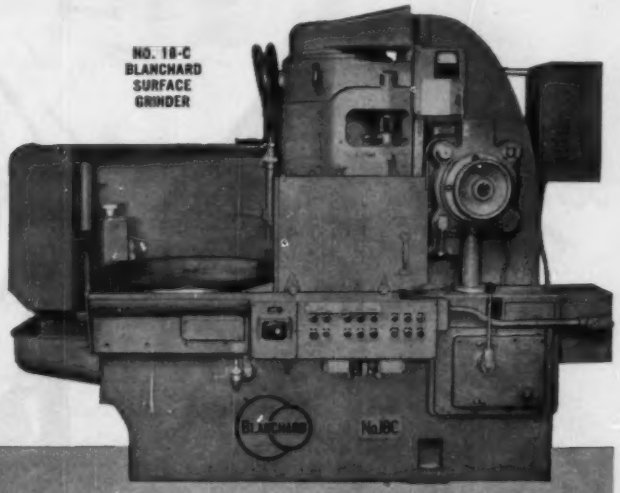


Tops of cylinder heads ground 21 per hour; stock removal 3/16" to 1/4". Bottoms 55 per hour; stock .012"; limits ± .001".

56 cast iron plates are ground on one side in one hour. Stock removal .140"; limits .001".

# for best results...

The Blanchard No. 18-C Surface Grinder has the speed and precision that guarantees economical grinding on an endless variety of jobs. After the initial setup, the automatic cycle handles every operation from start to finish. The operator is freed to prepare the next load or to operate a second No. 18-C Grinder.



NO. 18-C BLANCHARD SURFACE GRINDER

# Put it on the Blanchard

## The 18-C Automatic Cycle...

Moves chuck to grinding position and starts it rotating

Starts wheel rotation and coolant pump

Provides rapid wheel approach to work

Engages power down-feed at preset rate

Changes to fine feed just before finished size is reached

Stops feed when work is to size—"sparks" out. Raises wheelhead

Stops wheel, coolant pump, and chuck

Moves chuck to loading position—demagnetizes chuck

Can be changed quickly to manual operation

***Automatically Controls Size!***

*Send today for your free copy of 18-C folder.*

BLANCHARD

## THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

# He proved that 1 wheel could

Jim Frederick's eleven years of experience as an abrasive engineer have covered most of the problems in the book. That's why he so often finds practical solutions when he runs into problems that are *not* in the book.

Steelcraft operator John Kulpa checks performance of new Bay State wheel on high speed steel form tool job.

# outperform 3 at Steelcraft Tool Co.

Steelcraft Tool Co., of Detroit, used to use three different grinding wheels to rough and finish the angles on straight high speed steel form tools ... one specification for roughing, two for finishing. Then Bay State came into the picture through distributor Jim Frederick of Detroit's Industrial Abrasives Co. He showed them how a single Bay State wheel specification would cut *fast* for roughing and *fine* for finishing.

Result: The new wheel eliminated the need for repeated wheel changes and both Roland Belardnelli, co-owner of Steelcraft, and John Kulpa, chief operator, rate it A-plus for speed and precision, too.

Why not talk to *your* Bay State distributor? Chances are he'll come up with more than one cost-saving idea for your grinding operations.

*Better grinding at lower cost – that is his business.*

BAY STATE
WHEELS of PROGRESS

# BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
*In Canada:* Bay State Abrasive Products Co., Brantford, Ontario.
*Branch Offices:* Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.

# ARMSTRONG
## WRENCHES

## Types and Sizes for Every Industrial Use

ARMSTRONG Wrenches have engineered designs, a wide safety factor of extra strength, accurately machined openings that go over screw heads or nuts easily, grip firmly —will not slip, round corners or mar faces.

Drop forged from special high tensile carbon and alloy steels, heat treated to an exactly pre-determined balance of hardness, toughness and tensile strength. ARMSTRONG Wrenches will not "chew out," will stand up through years of service, making work faster, easier and safer.

In sizes and types, ARMSTRONG Wrenches comprise the most complete line of industrial wrenches manufactured. Specify "ARMSTRONG" when ordering wrenches.

*Write for Catalog*

**ARMSTRONG BROS. TOOL CO.**
5215 W. ARMSTRONG AVE. • CHICAGO 30, ILL.

# STUCK DIES

. . . quickly, easily released with exclusive patented LODGE & SHIPLEY

## WEDGE TYPE RAM PRESSURE RELEASE

**THIS . . .** **NOT THIS!**

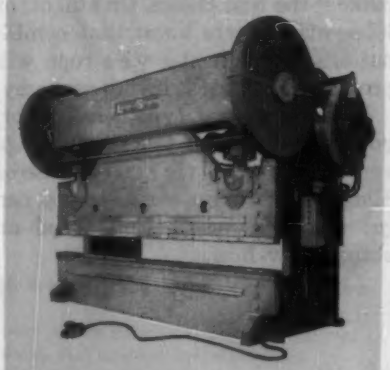
- **Use wrench . . . . . not a cutting torch**
- **in minutes . . . . . instead of hours**
- **without damage . . . . die holder destroyed**

When a press brake is stalled due to improperly adjusted dies . . . do you face a short delay or near disaster?

With a Lodge & Shipley Press Brake, release of the stuck dies is a quick, simple, non-destructive matter as described in the accompanying detail.

This is but one of many outstanding Lodge & Shipley Press Brake features designed for fast, accurate, efficient and dependable press brake operation. New literature gives complete details. Write: **The Lodge & Shipley Co., 3909 Colerain Ave., Cincinnati 25, Ohio.**

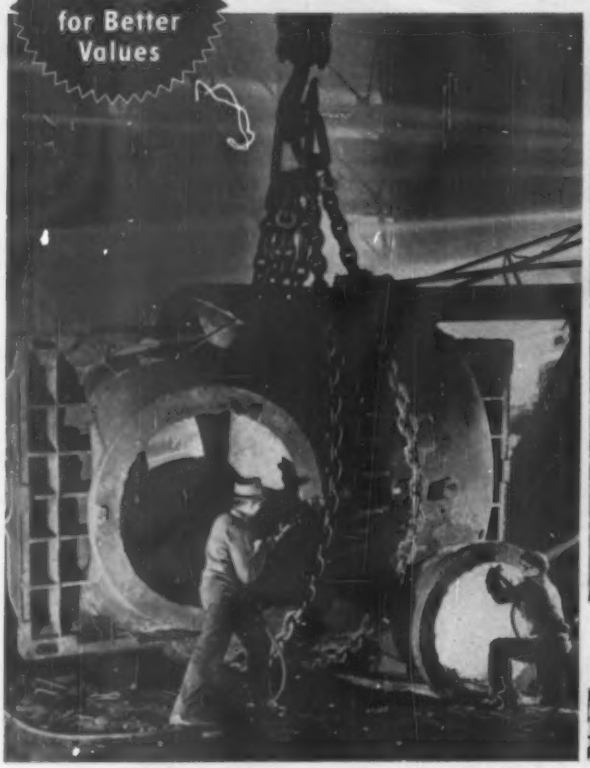
**The Lodge & Shipley Wedge Type Ram Pressure Release is unusually simple and rugged in design. A heavy steel wedge has a top angle that complements a similar angle on the base of the ram pitman socket housing. Held securely by a heavy steel plate, the wedges can be released quickly to provide up to ¼" additional clearance.**

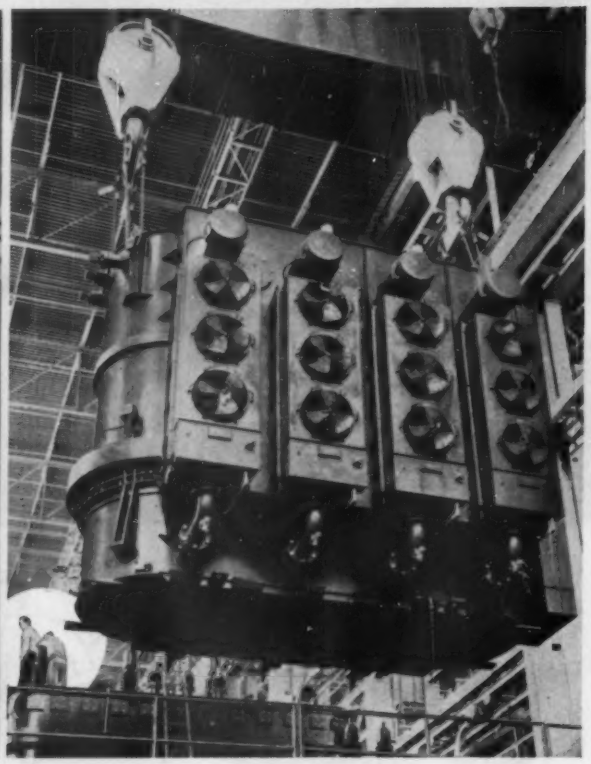


**Lodge & Shipley** . . . *your Lodge-ical choice*

ACCO for Better Values

# Acco Registered® Slings–Chain or Wire Rope





## Why different loads require different slings

Your rigger knows that different loads need different slings because of varying factors such as shape, weight, material, finish, protruding sharp corners, extremes of temperature.

On some jobs chain is best. On others the characteristics of wire rope make it the first choice. On still other jobs, wise riggers know that combinations of chain and wire rope will provide the greatest lifting economy.

No matter what type is called for, you can be sure of the safest slings and the best values in ACCO *Registered* Slings. From this one source you can get unbiased information based on actual know-how.

And you can get the exact slings your rigger should have.

One of the recent improvements is the new shaped Master Link now provided without extra cost on all ACCO *Registered* Slings, chain or wire rope. This link gives 18% greater resistance to distortion with no increase in weight. It is another reason why ACCO *Registered* Slings are recognized as the standard of efficiency and safety.

All ACCO *Registered* Slings are proof-tested, registered and identified for your greater assurance of safety.

• • •

Tell your distributor you'd prefer ACCO *Registered* Slings.

**WHAT "ACCO REGISTERED" MEANS**

1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification ring or tag on each sling
6. Signed Registry Certificate with each sling

**AMERICAN CHAIN & CABLE**
BRIDGEPORT, CONN.

ACCO

Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

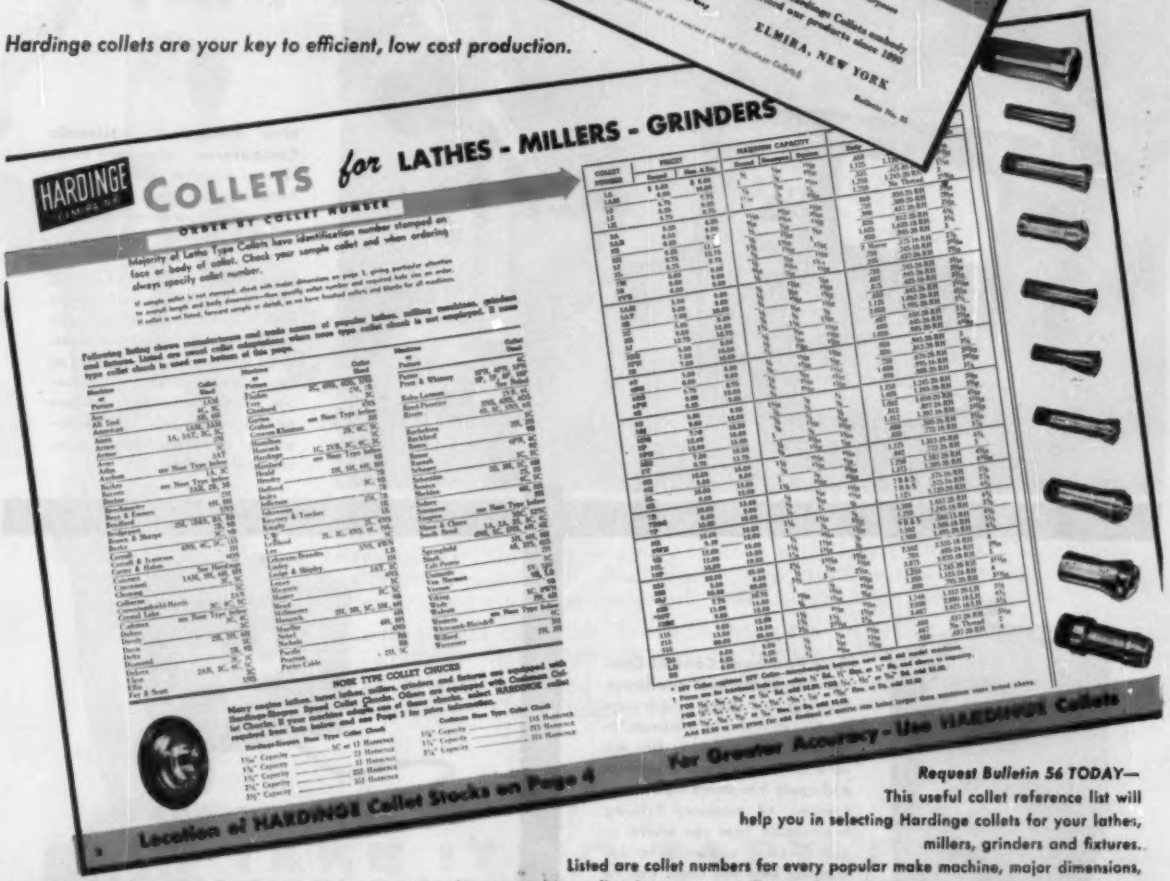
HARDINGE
ELMIRA, N.Y.

*Specify*

# HARDINGE COLLETS

- ACCURACY
- LONG LIFE
- ECONOMICAL COST
- STOCK DELIVERY

*Hardinge collets are your key to efficient, low cost production.*


HARDINGE
COLLETS for LATHES - MILLERS - GRINDERS
ORDER BY COLLET NUMBER
NOSE TYPE COLLET CHUCKS
Location of HARDINGE Collet Stocks on Page 4
For Greater Accuracy - Use HARDINGE Collets

***Request Bulletin 56 TODAY—***
**This useful collet reference list will help you in selecting Hardinge collets for your lathes, millers, grinders and fixtures.**
**Listed are collet numbers for every popular make machine, major dimensions, maximum capacities, collets for nose type collet chucks, stock locations, how to order and prices.**

**HARDINGE BROTHERS, INC., ELMIRA, N. Y.**
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

**Immediate stock delivery from Atlanta, Boston, Chicago, Dayton, Detroit, Elmira, Hartford, Los Angeles, Minneapolis, New York, Oakland, Philadelphia, St. Louis.**

**T-P Ingenuity Puts Profit Into Automatic Gaging and Sorting** . . . Taft-Peirce Air-Electric Gaging has resulted in a variety of automatic gaging and sorting machine installations. Individual parts are air gaged for size, then dropped into bins marked with size categories. T-P creative engineering makes mass inspection and sorting of parts a profitable reality in your plant.

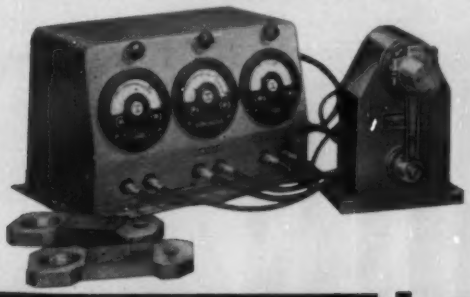
**Taft-Peirce Gaging Stations** bring rugged performance plus tight tolerance control to transfer lines . . . T-P equipment handles a multitude of dimensions on a day-in day-out basis, repeating readings without fail. There's one right answer to every automatic or semi-automatic gaging application, so take advantage of specific experience in this specialized field . . . take your problem to the Taft-Peirce Instrument Gage Division.

**New Versachek Electronic Comparator** laboratory accuracy at minimum cost . . . Taft-Peirce provides application versatility plus laboratory precision, priced to appeal to every shop large or small. Four switch-selected graduations: .0005", .0001", .00005", .00001" — all on one dial. Calibration is simple, with 100% linearity over entire scale. Use a Versachek to police wear on shop working gages, for size control beside the machine, or use special output jack with oscilloscopes, ink recorders, and other inspection devices.

**New Packaged Control Center For Simplified Feedback Gaging** . . . Here's in-process quality control with minimum investment in equipment. Buy this air-electric control unit from stock and apply it to on-the-machine inspection. All accessory fixturing is available from one source — Taft-Peirce — plus whatever application help you need. Use for size control with pass or reject indicated by pilot lights.

**New Functional Styling For T-P CompAIRator Air Gages** . . . Special slanted face has glare-reducing visor for easier reading under all lighting conditions. Zero and range setting knobs are within easy reach of the inspector. Plus production-tested T-P Velocity-Venturi Air Circuit for exceptional dependability and accuracy. Use the CompAIRator to sort at the bench with instrument-mounted plug, ring, or snap gage, or at the machine with air hose extension.

**Now! Pass or Reject Parts** having related dimensions by one computed reading on one dial . . . Patented Taft-Peirce CompUtair streamlines jobs requiring: (1) check of taper between two diameters, (2) alignment or concentricity of two diameters, (3) squareness of bore to face, (4) center distance without respect to hole size, (5) bend or twist developed during machining. Pass or reject a number of product dimensions simultaneously with one composite reading on one dial. You can't beat the CompUtair for speed and economy on any long-run job.



# Look what TAFT-PEIRCE is Doing with INSTRUMENT GAGING

***New, Electronic Versachek plus redesigned CompAIRator bring wide versatility, extreme accuracy to quality control.***

Like to find new ways to do things? Cut corners? Shave costs? Help your company build a better product?

There's almost always a new way to do it with Taft-Peirce Air Gaging! Engineers are continually finding more opportunities to streamline inspection and quality control with Taft-Peirce Instrument Gaging.

Take advantage of all the "tricks to the trade" in gaging. Consult Taft-Peirce for the most advanced, lowest-cost solutions to your problems.

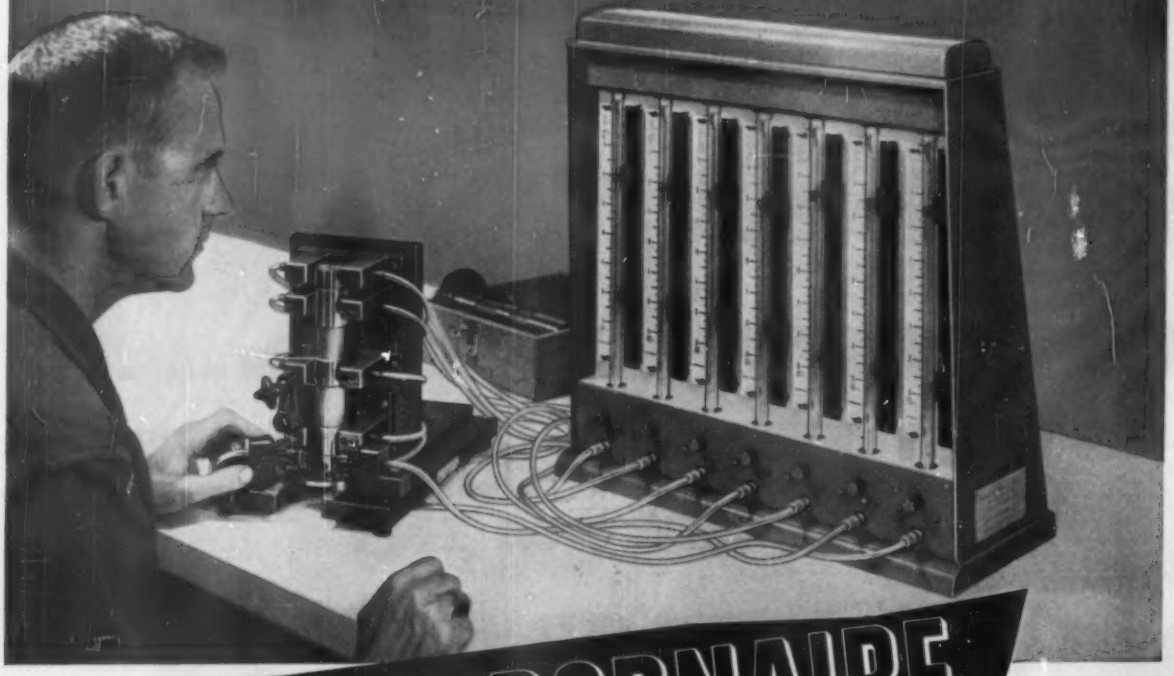
*Get all the Facts* . . . from your nearest Taft-Peirce representative or write for Air Gage Bulletin No. 613.

## TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO., WOONSOCKET, R. I.

T-P Means TOP Precision

# Speed Inspection
## OF PRODUCTION PARTS!



NEW **DEARBORNAIRE**

## MULTIPLE COLUMN AIR GAGING INSTRUMENTS

To speed inspection of production parts, new Dearbornaire air gaging instruments are now offered in multiple column units designed to permit more accurate simultaneous checking of as many dimensions as may be required for a given part. What's more, each unit incorporates all of the advanced design features which have made Dearbornaire the most practical, most versatile column type instrument ever produced . . .

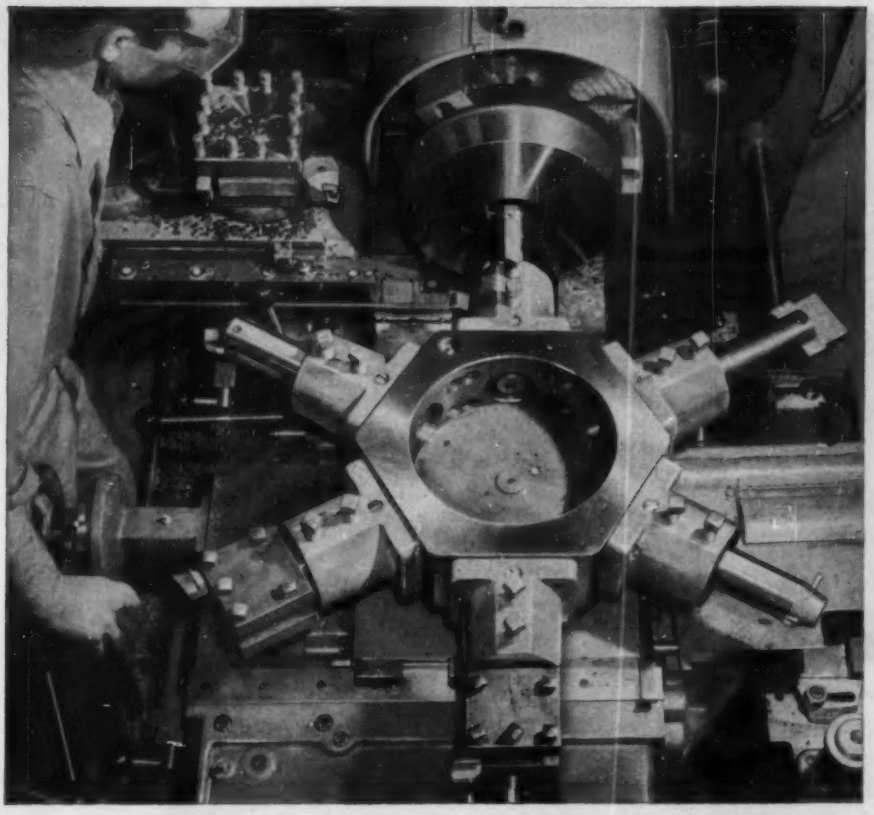
- New higher rated pressure system and built-in circuit restrictions make them virtually self-cleaning, reduce maintenance to a minimum.
- New glass tube has a characterized internal taper which provides positive linear accuracy over the full extent of the calibrated scales.
- Easy-to-read Zero-centered scales permit use of instrument for normal inspection, statistical quality control, and as a tool setting gage.
- Interchangeability of component parts simplifies conversion from one amplification to another, reduces spare parts inventory costs.

Plus a complete line of air gage spindles, rings, snaps and cartridges all precision finished to give you greater accuracy, longer wear life. Free demonstration arranged upon request. Write for details today!

**Special Air Gaging Fixtures** designed and built to meet your particular application requirements. Complete engineering service available upon request.

Send part print showing all dimensions to be checked and tolerances required for prompt quotation and delivery.

**AIR GAGE DIVISION**
**DEARBORN GAGE COMPANY**
22038 Beech Street • Dearborn, Michigan



# Expert setup gets more work per chucking

## How manufacturer uses C/F turret lathe to produce variety of chuck bodies with only one tool change

To do the job, the manufacturer selected a Gisholt 1L Saddle Type Turret Lathe with a cross-feeding hexagon turret. A 15″ 3-jaw air chuck holds down chucking time. One set of adjustable serrated jaw bases handles the different workpiece sizes for first machining operations. A quick-indexing square turret on the cross slide carries turning, facing and chamfering tools, which work simultaneously with tools on the hexagon turret.

Three stub boring bars on the hex turret bore, counterbore, recess and back face. Because size is set with the cross-feeding turret, these same boring bars are used on different part sizes. Also on the hexagon turret are 2 box-type tool posts for facing, boring or recessing—used for different size workpieces because of the cross-feeding feature. A threading attachment lets the manufacturer thread the hubs, and a taper attachment handles up to 8 inches taper per foot when required.

The sixth tool on the hex turret, a spade cutter, is used for final sizing and is the only special tool changed for each job.

Simple, low-cost tooling combined with the cross-feeding hexagon turret offers maximum efficiency in handling various sizes of similar parts. The rugged Gisholt MASTERLINE Saddle Type Turret Lathes have the speeds, feeds and power to complete the work in the least amount of time. Call your Gisholt Representative today, or write Gisholt for literature.

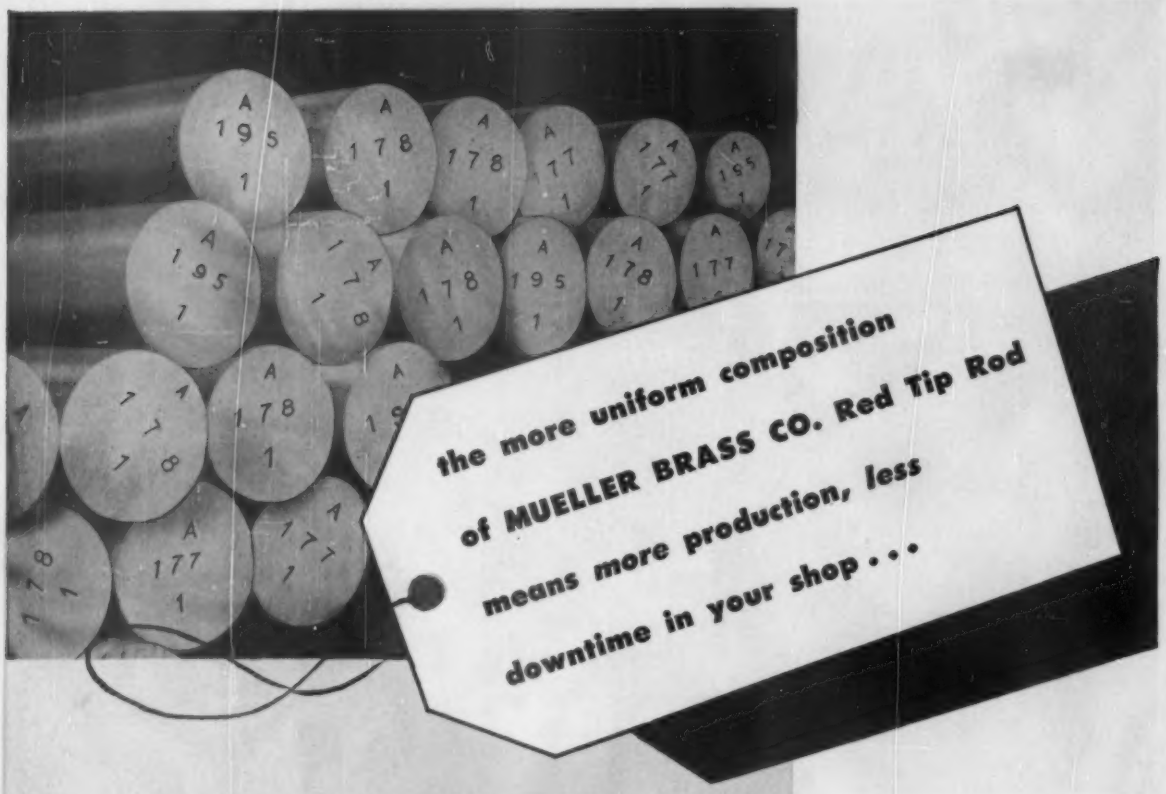
MASTERLINE GISHOLT SINCE 1887 GISHOLT

**GISHOLT** MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

**WRITE TODAY** for complete set of Gisholt MASTERLINE Saddle Type Turret Lathe Bulletins.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS



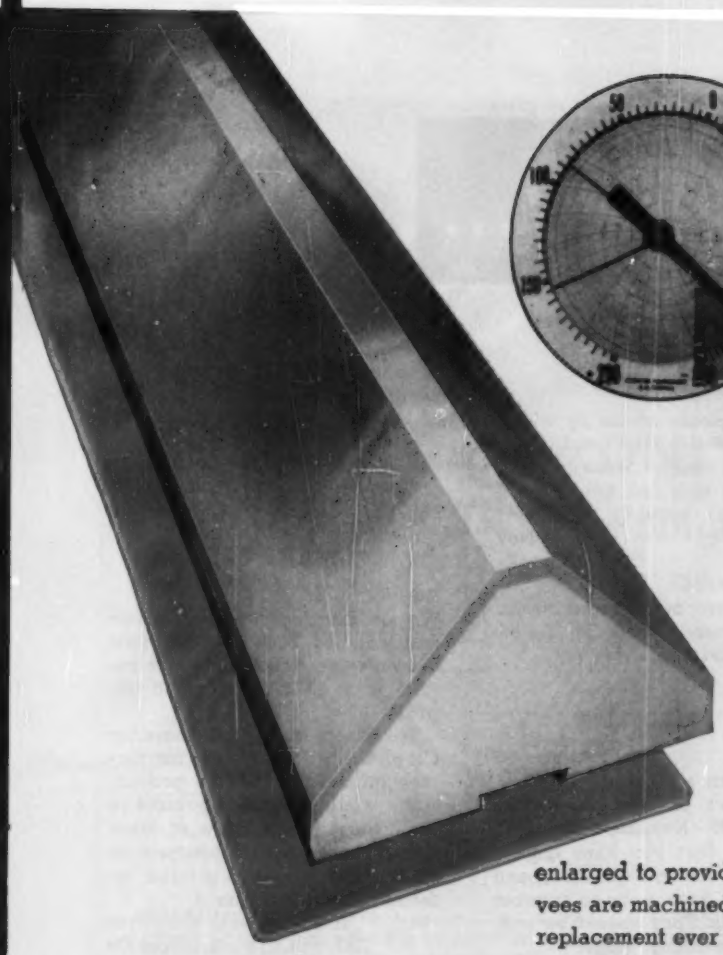

The new semi-continuous process for casting copper alloy billets at Mueller Brass Co. means that the Red Tip Rod you buy is more uniform than ever before. Production tests have proven that rod made under this new automated process has many advantages for you . . . advantages such as faster machining, increased tool life, less downtime and a finer finished product.

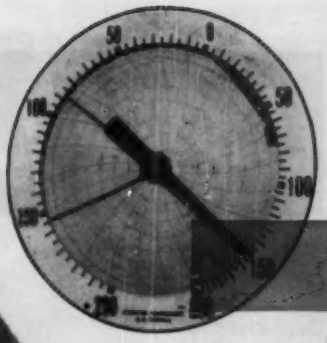
The larger volume of metal being cast as a unit in our new process gives us better control of composition. Laboratory technicians keep a continual check on the melt analysis by means of a direct reading spectrometer which takes only 90 seconds to analyze the alloy. Metal is improved through a new cooling process that results in a greater internal soundness. These and many other advanced techniques result in billets (and therefore rod) which are always the same from one lot to another. All billets are stamped and systematically recorded so that each customer rod order can be extruded from billets of uniform composition.

For the next production run on your automatic screw machines, order Red Tip Brass Rod, and see how our new automated process results in more profitable production for you. Write today for Engineering Manual FM-3010, "Copper Base Alloys in Rod Form", for more detailed information.

189

**MUELLER BRASS CO.**
Port Huron 22, Michigan





# 150° BELOW

After hardening to 62 Rockwell C the solid tool steel "AMERICAN" Pacemaker bed vees are stabilized in the deep freeze at 150 degrees below zero.

This freezing treatment not only raises the surface hardness but thoroughly stabilizes the metallurgical structure and prevents twisting or warping.

On the new DeLuxe Model "AMERICAN" Pacemaker the bed vees have been enlarged to provide extra large bearing area for the carriage. The vees are machined to gauge tolerances for interchangeability should replacement ever be required.

This is but one of the outstanding advantages offered by the new DeLuxe Model Pacemaker. Others are illustrated and described by bulletin No. 124—want one?

**THE AMERICAN TOOL WORKS CO.** Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

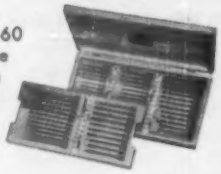
LI has a REAMER SET for every purpose, plant or pocketbook

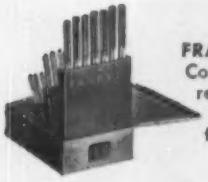
**HELICAL DIE MAKERS**
5½" taper per foot, and .006 per inch. High speed steel reamers with a high helix angle for machine reaming.

**TAPER PIN**
¼" taper per foot. Designed for machine or hand reaming standard taper pin holes.

**DOWEL PIN**
For machine reaming standard dowel pin holes. Sets from ⅛" thru ½".

**WIRE GAGE**
Wide range of 60 reamers for wire gage sizes from (.2280) #1 thru (.0400) #60.





**FRACTIONAL SIZE**
Complete range for reaming fractional size holes. Sets from 1/16" thru ½" by 64ths.

Other sets include: Letter size, Over & Under Size and Drill & Reamer Blanks. 34 sets in straight or spiral flutes to choose from, plus 8 combinations of drill and reamer blank sets.

L&I

*"the reamer specialists"*

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

# Letters...

To American Machinist
338 W 42nd St, NY 36, NY

## Burnishing

Dear Sirs:
Will you please advise us where we can secure the multiroller burnishing tools described in "Short cut to a fine finish" (*AM*—Oct 21 '57, p156)?

P C Noy
*Orillia, Canada*

*They can be secured from: Madison-Faessler Tool Co, Moberly, Missouri*—Ed.

## Forecast

Dear Sirs:
I have seen a copy of your Special Report on "Metalworking: 1962" (*AM*—Nov 18, '57, p121) and think that you have done a very good job in assembling and publishing such a large number of forecasts. They should be very valuable to many people.

Robert Talmage
*New Canaan, Conn*

Dear Sirs:
I would like to compliment you on your very fine Special Report "Metalworking: 1962."

In this report we found a timely article on "Threading" by S W Lovejoy of Pratt & Whitney. We would like to obtain 500 reprints of this article, for which we will gladly pay.

E K Welles, Jr
*South Beloit, Ill*

## Chrome case

Dear Sirs:
We are intrigued by your article entitled "At 3000 F CRS plus Chrome-case outlasts stainless steel 5 to 1" (*AM*—Nov 18 '57, p162).

We have written to Chromalloy Corp, White Plains, NY, for further information on the process.

We would also be interested in finding out if you know of other sources of supply for this process or if there is other printed information available on it.

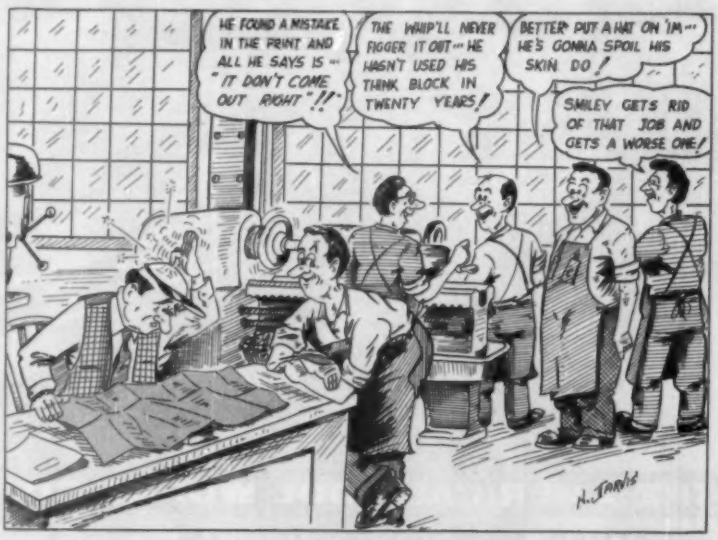
H F Rothwell, *Vice Pres*
*Delavan Manufacturing Co*
*West Des Moines, Iowa*

*At present, Chromalizing is done only at the White Plains plant of Chromalloy Corp.*

*As far as we know, the only other published information on the process is the article, "Chrome*

## SHOPMATES

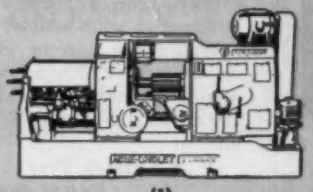
N. Jarvis


HE FOUND A MISTAKE IN THE PRINT AND ALL HE SAYS IS — "IT DON'T COME OUT RIGHT"!!
THE WHIP'LL NEVER FIGGER IT OUT — HE HASN'T USED HIS THINK BLOCK IN TWENTY YEARS!
BETTER PUT A HAT ON 'IM — HE'S GONNA SPOIL HIS SKIN DO!
SMILEY GETS RID OF THAT JOB AND GETS A WORSE ONE!
N. Jarvis

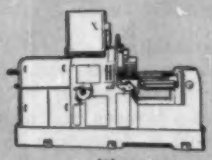
# Acme-Gridley...

## The World's ONLY COMPLETE LINE

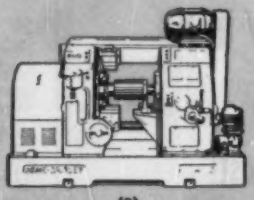
### of Single and Multiple Spindle Bar and Chucking Automatics



(1)



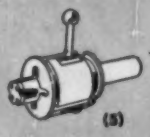
(2)



(3)

**MACHINERY DIVISION:** (1) Bar Automatics—4, 6 and 8 spindle models—22 sizes, in capacities from 7/16" to 7¾". (2) Single Spindle Automatics—Bar Type—4 sizes, in capacities from 3½ to 6"; Chuck Type, 12" capacity. (3) Chucking Automatics—4, 6 and 8 spindle models—8 sizes, in capacities from 5¼ to 12".

(4)



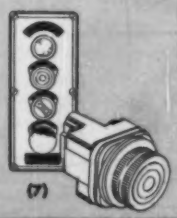
(5)

(6)

**THREADING TOOLS DIVISION:** (4) Vers-o-Tool Self-Opening Die Heads—capacities from 5/16" to 6½". (5) Collapsible Taps—capacities from 1 7/16" to 5". (6) Acme-Fetto Self-Opening Thread Rolling Heads—capacities from 1/16" to 2".

Since building the first successful multiple spindle automatic lathe in 1893, the energy and resources of the National Acme Co. have been directed toward the constant improvement and engineering to maturity of these "Master Tools of Industry". How well we have succeeded is gauged not alone by the fact that more automatics bear the NAMCO nameplate *but also by the fact that every automatic bar and chucking machine built today employs the basic principles first perfected in the National Acme prototype.*

Other National Acme "Firsts" include pioneering circular cutter threading tools to enable mass production thread cutting, introducing self-opening thread rolling heads, and building heavy-duty switches, solenoids and other electrical components—*"Built As A Machine Tool Builder Would Build Them".*



(7)

(8)

(9)

(10)

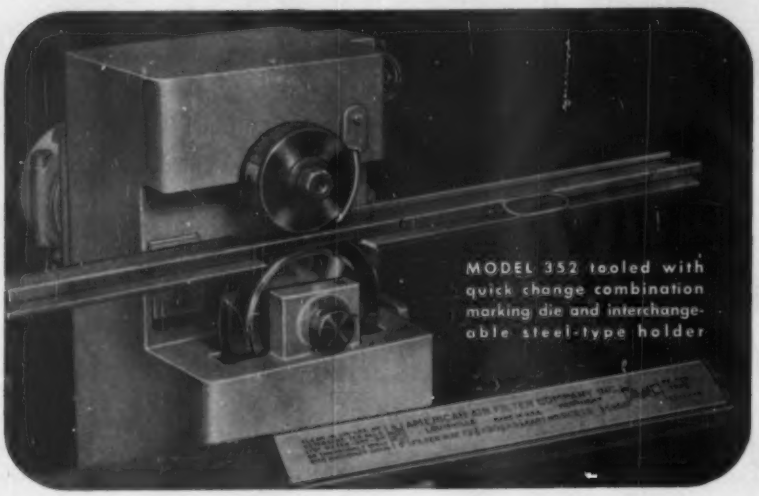
**ELECTRICAL MANUFACTURING DIVISION:** (7) Namco GOLD-N-RING—Heavy-duty, oil, water and dust-tight Control Station Switch. (8) Heavy-duty Push Button Switch. (9) Snap-Lock Limit Switch. (10) "Hard-Metal Weld" Solenoid—push or pull to 25 pounds.

**National Acme Nameplates Mean SERVICE... Anywhere... Anytime**

# National Acme

THE NATIONAL ACME COMPANY, 171 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

LEADERS IN INDUSTRY MARK WITH NOBLEWEST




# NEW — IMPROVED

## NOBLEWEST BAR AND STRIP STOCK MARKER
## provides better, faster marking... at lower cost!

This Noblewest rapid production marking machine was developed especially for marking bar and strip stock, and other long, flat parts of metal, plastic, hard rubber or wood with the manufacturer's name, trademark, part number or other inscriptions.

This machine employs the *roll-marking* process originated by Noblewest to produce sharp, permanently indented impressions that will last as long as the product itself.

Noblewest is equally famed for fine marking dies. They are made of the very finest steel and to the most exacting standards of quality . . . yet, they are competitively priced.

*For comprehensive catalog, write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Connecticut*

MARK IT BEST WITH NOBLEWEST Roll-O-Matic MARKING

NOBLEWEST IMPROVED MARKING DEVICES

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

*diffusion improves both tools and parts"* (AM—*May 21, '56, p141*)—Ed.

Dear Sirs:

We have read with great interest your article on the merits of chrome-case over stainless steel for achieving heat resistance.

We would like additional information concerning this process and would appreciate your help on the following questions:

Would a permanent mold such as the kind used to pour bronze castings—a mold made of chrome-copper—take a chrome case as outlined in your article?

Would the chrome case be a solid layer of chrome, and if so, would the thermal conductivity of the chrome-copper mold be affected?

J A Hatch, *Pres & Gen Mgr*
*United Bronze Corp*
*Detroit, Mich*

*The Chromalizing process is not applicable to metals and alloys with low melting points, because it requires a furnace heat of from 1500 to 1900 F, depending on the properties desired.*

*However, there is at least one case on record—a soldering iron—where bronze was replaced with a free-machining steel that had been Chromalized. The heat conductivity of the steel was about the same as the bronze.*

*The surface produced by the process is not a solid layer of chrome, but is an iron-chrome al-*

## Helpful Henry

*by L. Hoppes*

*"It sticks! I'll help you pull it out!"*

*loy, with the chrome amounting to 40 to 50% at the surface. One result is that the heat conductivity of the surface alloy is lower than that of the base metal. In fact, it is about the same as the 400-series stainless steels.*

*However, the chrome diffuses only a short distance into the base metal—approximately 0.001 in. in most applications—and the thin alloy layer has little effect on the over-all conductivity of the part* —Ed.

## CALENDAR

SOCIETY OF AUTOMOTIVE ENGINEERS —Annual Meeting and Display, Jan 13-17, Sheraton Cadillac and Statler Hotels, Detroit, Mich.

ARMOUR RESEARCH FOUNDATION AND AMERICAN WELDING SOCIETY—Annual Midwest Welding Conference, Jan 29-30, Illinois Institute of Technology (Chemistry Building), Chicago, Ill.

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION—Winter Meeting, Feb 5-8, Ambassador Hotel, Los Angeles, Calif.

AMERICAN MACHINE TOOL DISTRIBUTORS ASSOCIATION — Spring Meeting, Mar 10-11, Hotel Roosevelt, New Orleans, La.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS AND AMERICAN ROCKET SOCIETY—Joint Aviation Conference, Mar 17-20, Hotel Statler-Hilton, Dallas, Texas.

SOCIETY OF AUTOMOTIVE ENGINEERS —Production Meeting and Forum, Mar 31-Apr 2, The Drake, Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS —Aeronautic Meeting and Display, Apr 8-11, Hotel Commodore, New York, NY.

AMERICAN WELDING SOCIETY — Spring Meeting and Welding Show, Apr 14-18, Statler Hotel, St Louis, Mo.

AMERICAN SOCIETY OF TOOL ENGINEERS—Tool Show, May 1-8 (closed Sunday), Convention Center, Philadelphia, Pa.

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION—Spring Meeting, May 3-6, Statler Hotel, Washington, DC.

AMERICAN SOCIETY FOR METALS — Southwestern Metal Exposition and Congress, May 12-16, State Fair Park, Dallas, Texas.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Semi-Annual Meeting, June 15-19, Hotel Statler, Detroit, Mich.


NEW!

Two Cylindrical Die Type

THREAD ROLLING MACHINE

HORIZONTAL TYPE

Especially Suited for Job Shops

for Both In-feed and Thru-feed Rolling

The use of highly skilled setup and operating personnel is not required, because of the simplicity of operation and of change-over from one job to another. A cam-actuated head feeds the dies into the work and a fine micrometer adjustment provides for accurate final sizing. Can be used for manual, semi-automatic or completely automatic feeding.

Supplements widely used Reed cylindrical die thread rolling machines of the three die type.

DIAMETER CAPACITIES

In-feed - up to 2 inches

Thru-feed - up to ¾ inch

*Write for Machine Bulletin B 111-1*

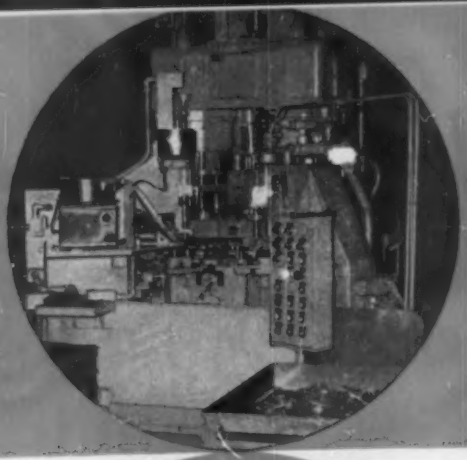
REED ROLLED THREAD DIE CO.

*Specialists in Thread and Form Rolling Tools and Equipment*

WORCESTER 1, MASSACHUSETTS, U.S.A.

Sales Offices In: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

TRM-186



*Two sizes of motor end-plates are assembled, bored, drilled and tapped in a Natco 3-Way Machine.*

*At Wagner Electric Corporation*

# One Natco

NATCO

# Assembles, Bores, Drills and Taps... Reduces Labor Cost 70% On Small Motor End-Plates

This Natco combination assembly and multi-drilling machine presses a bearing sleeve into the end-plate, rough and finish bores the outside bearing-cap hole, drills an oiler hole at an angle, drills four (4) thru-bolt holes, and drills and taps two (2) 8x32 cover plate holes. *Production is 170 pieces per hour.*

This Natco accommodates two sizes of motor end-plates without changes in the basic rotary-table tooling. In addition to this important versatility the engineers at Wagner Electric point out these other advantages:

- *one operator* controls the assembly and machining from one station.
- *work scheduling* is simplified due to the short machine cycle.
- *in-process inventory* can be kept at a minimum because of high production rate.
- *floor space* is made available for other operations.

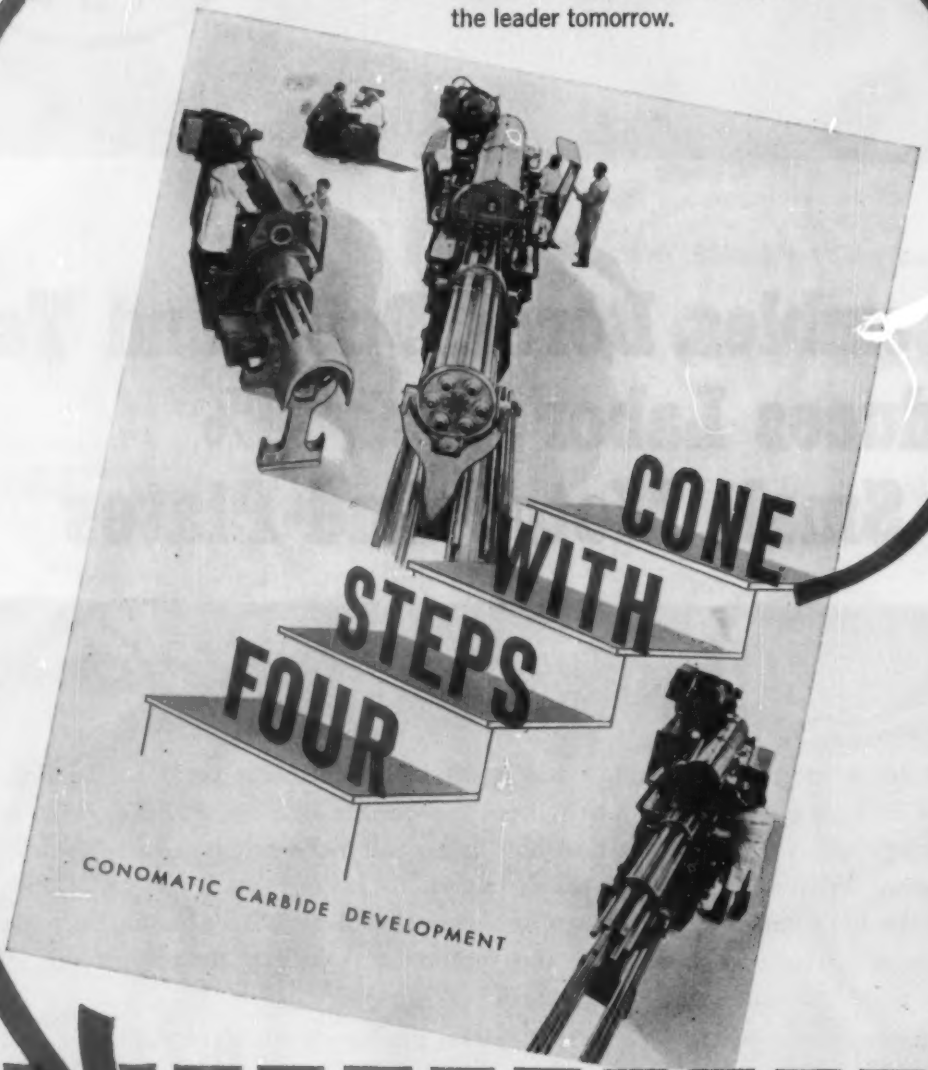
Natcos perform all kinds of drilling, boring, facing and tapping jobs in every conceivable combination and sequence.

Ask the Natco Field Engineer about the newly perfected tape control systems for Natco production tools.

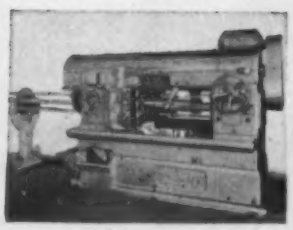
## National Automatic Tool Company, Inc.

*Richmond, Indiana* *Multi-spindle drilling, boring and tapping machines. Special machines for automatic production. Call Natco Offices in Chicago, Detroit, New York, Buffalo, Philadelphia, Cleveland, Los Angeles; distributors in other cities.*

If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.




Write for your free copy of this important booklet today!



# Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

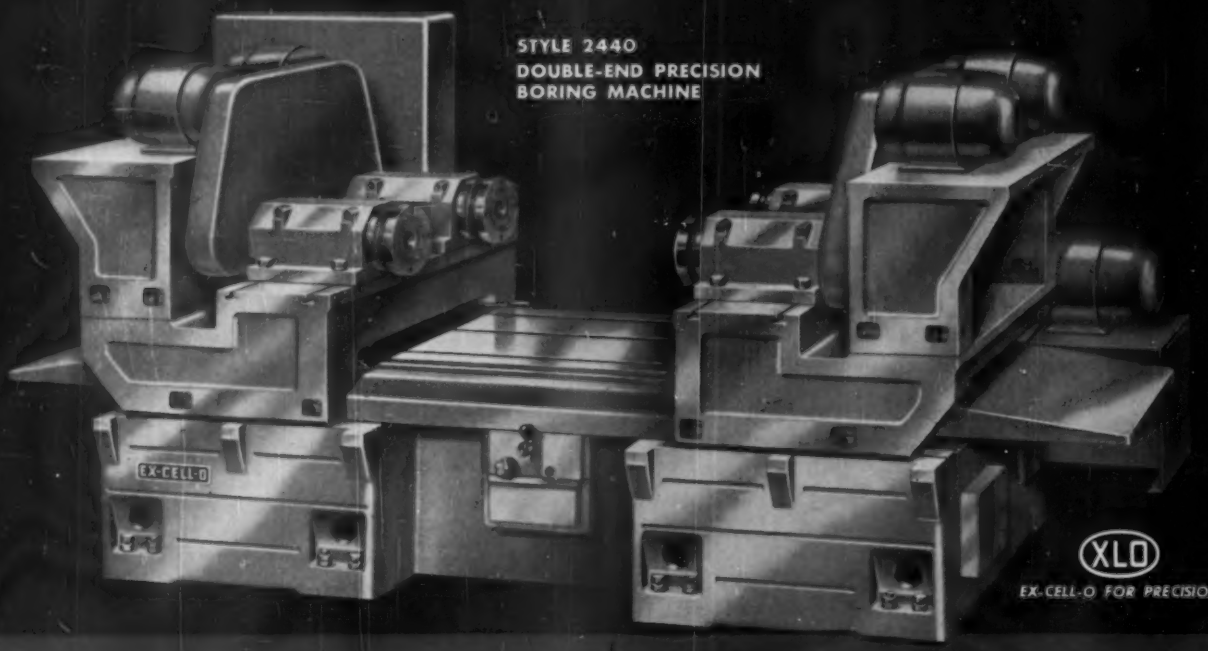
# Spot news...

- **Stainless and alloy sheet steel up to 90 in. wide,** almost twice the width of sheet now offered, may soon be marketed by U S Steel as a result of a new "sandwich rolling process" under development. Chief advantage is in aircraft, where such sheet will cut overall plane weight by eliminating many joints and seams needed in fabrication with narrower sheet.
- **Scrap price drop, with added labor and materials costs,** has put further squeeze on profit margins of commercial stampers. One stamper reports income from scrap sale down 40% this year from last, making a difference of 25% in his net income.
- **Process that could revolutionize heating of dies** for hot-working of metals and plastics, "Adaptatherm," has been developed by H W Tuttle Co of Adrian, Mich. An insulated resistance wire (80 Ni, 20 Cr) is encased in Fiberglas, formed to any shape, placed in the desired mold and "cast in" with molten aluminum. Generated heat is transmitted immediately to the surrounding metal. Result: one-hundredth the leakage of conventional units. Development is adaptable to all sorts of appliances, too.
- **Canada's "replace U S imports with British ones" trade mission** is getting the red carpet treatment in England, where requests for interviews from 1400 British firms have caused the mission to set up an assembly line interview schedule of one firm every 20 minutes.
- **Wage increase of 5½% and a standard 44-hr week** (instead of a previous 45-hr week) has been granted to West Germany's 2.5-million metalworkers. This is Germany's first wage-hour adjustment in two years.
- **Chrysler may build a small car in Europe,** building or buying facilities there because it would cost too much to make a small car in the U S. Decision will be made in 6 to 12 months.
- **Every mass-produced product in Hungary must now be government approved** for quality before it can go on the market. Existing products, too, must maintain quality, or be taken off the market.
- **Specialists from 50 Los Angeles metalworking firms** are available as consultants (for a fee, of course) from Associated Specialists Inc, Los Angeles, in research, design, fabrication and assembly of metals.
- **Plymouth Savoy 1957 models will be built in Brazil** at a rate of 6000 a year, with 95% of parts produced by nationalized Brazilian industries, by 1961. Plymouth will bring in used equipment from the U S for the job.
- **Look for Martin Co to take over "a couple of aircraft concerns"** and a "couple of companies strong in electronics and guidance systems." Says Martin President George Bunker, "We foresee mergers (in the aircraft industry) and intend to be ahead of this movement."
- **Volkswagen intends to build 500,000 cars in 1958.**
- **British tractors will be assembled in Detroit by Massey-Harris,** with two-thirds of all components manufactured in England, very soon.
- **Japan within the next few months will decide what U S plane to produce.** Choice lies among the F-100, F-104, N-156 and F-11.

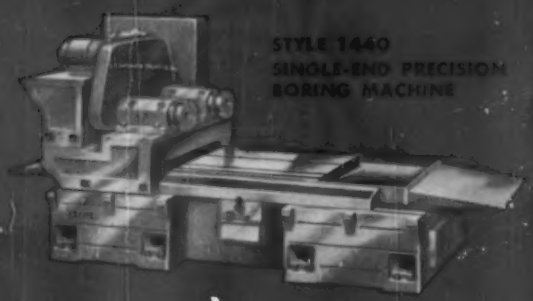
## Spot index to major News stories...


Labor Outlook ..... 110
Missile Output Plans Firm Up ..... 112
Chrysler Looks at Spline Rolling ..... 113
Tennessee Bids for Metalworking ..... 114
Field Report ..... 116
Names in the News ..... 119
Washington ..... 55
Detroit ..... 57
Aircraft & Missiles 59
Machine Tools .... 61
What's Ahead in Metalworking 63
in Business ..... 64
Surplus Machinery Market ..... 146

# announcing




XLO
EX-CELL-O FOR PRECISION




# TWO NEW HEAVY DUTY PRECISION BORING MACHINES

57-76

**EX-CELL-O BORING MACHINES** perform better because of deep-down solid construction, high precision and exceptional versatility. The minute you put one to work profits go up, operating costs go down. And these two new additions to the Ex-Cell-O line are no exceptions:

**DOUBLE-END STYLE 2440:** This new double-end Ex-Cell-O machine, designed for large workpieces, combines capacity and rigidity for bulky parts while allowing for multiple-station high production work on smaller parts. Spindle bridges can be moved together or spread apart to suit the workpiece.

**SINGLE-END STYLE 1440:** This new heavy-duty precision boring machine is identical to the 2440 (above) except that it is equipped with one bridge for single-end operations.

Whichever model fits your particular production requirements—you'll find their rugged versatility performs a wide range of rough, semi-finish, and finish operations which lowers your per-unit costs, increases your potential profit.

For further information, call your local Ex-Cell-O Representative. He'll provide all the facts about these two new machines. Or, write direct to Ex-Cell-O.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

# Washington ... NEWS REPORT

## Single project managers ...

. . . are the administration's first step toward centralized, civilian-controlled development—and possibly production—of new military weapons. It may bring a revamping of contracting procedures for companies in defense work—changes in supervision of contracts, profit allowances, allowable costs, contract awards, and the like.

**Single managers will be independent** of the military services. They will run development of the infant anti-missile missile system, reconnaissance satellites, space vehicles and platforms, and other newfangled projects outside the traditional realms of the three military services.

**This is the closest the U S has come to** the British weapon development system—a system which many expert critics of U S defense policy say should be emulated here. In Britain, the military services originate requirements for new weapons. Then the independent Ministry of Supply determines the technical feasibility of such projects and follows through on development—setting up a budget, selecting contractors, and so forth. Only after a new weapon is fully proven operational is it turned over to one of the services.

**The Defense Dept has been frequently urged** to create such a system as a means of curbing duplication of research effort between the Services, stimulating new weapon schemes, and of strengthening general control over weapon development.

**Up to now,** the Pentagon has shied away from this kind of centralized operations except for off-the-shelf items—like fuel, food, conventional ammunition, medical supplies, and photographic goods. But the speedy advent of a new generation of military weapons—and the growing evidence of Russian advances in this field—has now forced Washington to take space vehicles and new rocket development out of the direct control of the military services.

## Anti-recession measures ...

. . . are going to be mild, at least for the foreseeable future; nothing drastic is being proposed as yet. But there's no longer any reluctance to label the business softness of the past few months as a recession.

**Treasury, Commerce Department,** and White House economists now admit the downturn began last September. They expect the decline to be a "saucer"—that is, a shallow decline followed shortly by another uptake.

**The upturn, as they see it now,** should come perhaps in the summer or early fall. The end of 1958 should see business well on its way into another surge of expansion.

## Unemployment ...

. . . is the indicator the politicos watch closest, even closer than they do car-loadings, steel production, auto output, retail sales or the Federal Reserve Board's Index of Industrial Production.

**Unemployment has been minor** for 2 or 3 years now—running around 2.5 million. It may go to 3 million by the beginning of the year, perhaps 4 million soon thereafter, some say. If unemployment rises to 5 million, this could trigger both the administration and the Democrats in control of Congress to get behind anti-recession legislation.

**A tax cut would be the first thing on the list**—but it might not be voted if the Congressmen were convinced there were signs of an upturn in the economic indicators. At the 5-million-unemployed level, Congress would probably hold off on tax reduction, particularly if the administration was still opposed to it.

## Transportation costs ...

. . . will go up early in 1958. Railroads are getting fixed to ask the Interstate Commerce Commission for another round of rates boosts that will cost shippers an additional $200 million per year. This comes on top of about $1 billion in rate increases granted the rails during 1957. Traditionally, the truckers and waterway lines follow the railroad rates upward.

## How to keep tabs ...

. . . on technical information is the subject of a new survey being made by the National Science Foundation.

**The agency is querying 25 leading companies** to see how they handle the problem. There won't be any evaluation of the systems, but the report will include full description of the system, size of the information file, rate of growth of their files, and the number of people needed to operate it. Included in the survey will be such companies as DuPont, Monsanto, Union Carbide, Food Machinery & Chemical Corp, and several major metalworking firms.

# PRECISION PERFORMANCE...

To the IGY scientist, precision performance means unerring calculations carried to the Nth degree of accuracy to establish new frontiers in man's insatiable thirst for knowledge.

To tap users, precision performance means production-line continuity, better threaded parts, increased tap life . . . and BAY STATE!

## BAY STATE TAPS

**Bay State Tap & Die Company**

**Mansfield, Massachusetts**

On the nearby shelves of your Industrial Supply Distributor

# Detroit . . .

## Need a car please? . . .

Now that the introductory flurry is over, demand for new cars can best be described as spotty. A Chrysler executive admits that the public is "playing a little hard to get." His company's total production for the first two weeks of December was down about 25% from last year. Tentative schedules call for roughly 270,000 assemblies in the first quarter of 1958, 100,000 less than last year.

**Ford Motor Co is down the same percentage,** even with Edsel thrown in the pot. Best information shows 460,000 first quarter assemblies programmed, versus 545,000 last year.

**GM is gaining on the market.** Mainstay of GM's boomlet is Chevrolet, producing at an all-time high of over 45,000 units per week. Preliminary first quarter projections range close to 900,000 cars in all GM lines, up considerably from last year's performance. The company's return to its dominant market position seems assured.

**Brightest spot, though,** is American Motors, whose creaky factories are turning out 17% more Ramblers than last year at this time. Optimistic production forecasts indicate that the company is shooting for a 150,000 total in 1958. Of this, about 20,000 will be the 100-inch "American."

## Uneasy arithmetic . . .

The simplest calculation shows that 1958 will not be a six million car year even if an anticipated import volume of 275,000 is added.

**Auto executives are worried** and this is compounded by their inability to come up with an answer. An exception is AMC President George Romney, who has a lucid if slanted reason.

**He says: "The industry as a whole has not offered** products with the sales stimulus that would be provided by appropriate attention to changing consumer needs and desires."

## Wanted—sales appeal . . .

It is obvious that many makes of autos are not attracting customer kudos in proper volume. Chrysler officials at this point are undoubtedly questioning their decision to coast through the year without styling change. But styling is not all, as witness Ford and some GM products that have been thoroughly revamped without noticeable sales stimulus.

**Romney is right in part,** but "changing consumer needs and desires" is currently tempered with price resistance and caution.

**It is an extremely vicious circle.** A potential auto buyer reads pessimistic business forecasts, fears for his own welfare, and holds off spending money. Only a real bargain or a vital need, psychological or otherwise, will open his wallet.

**One corrective step comes in rumor form.** One of the Big Three is supposed to be considering asking its dealers to operate with a 15% markup instead of the normal 25. In return for acceptance of this more restrictive margin, the dealers would get a $100 to $300 cut in wholesale price to them.

## Where angels fear to tread . . .

Into this darkening picture will step Walter Reuther. Industry labor contracts with the UAW-CIO come up for negotiation next May.

**There is no evidence** that strike is in the offing. Automakers, now running at about 70% of economical capacity, are not yet hoarding steel and supplied components, a necessary preliminary to stockpiling cars.

**But higher 1958 prices are premised** on a volume similar to the past year, plus the expectation of higher labor costs. A combination of poor sales and unrealistic wage demands might tempt Detroit to shut the door in Reuther's face.

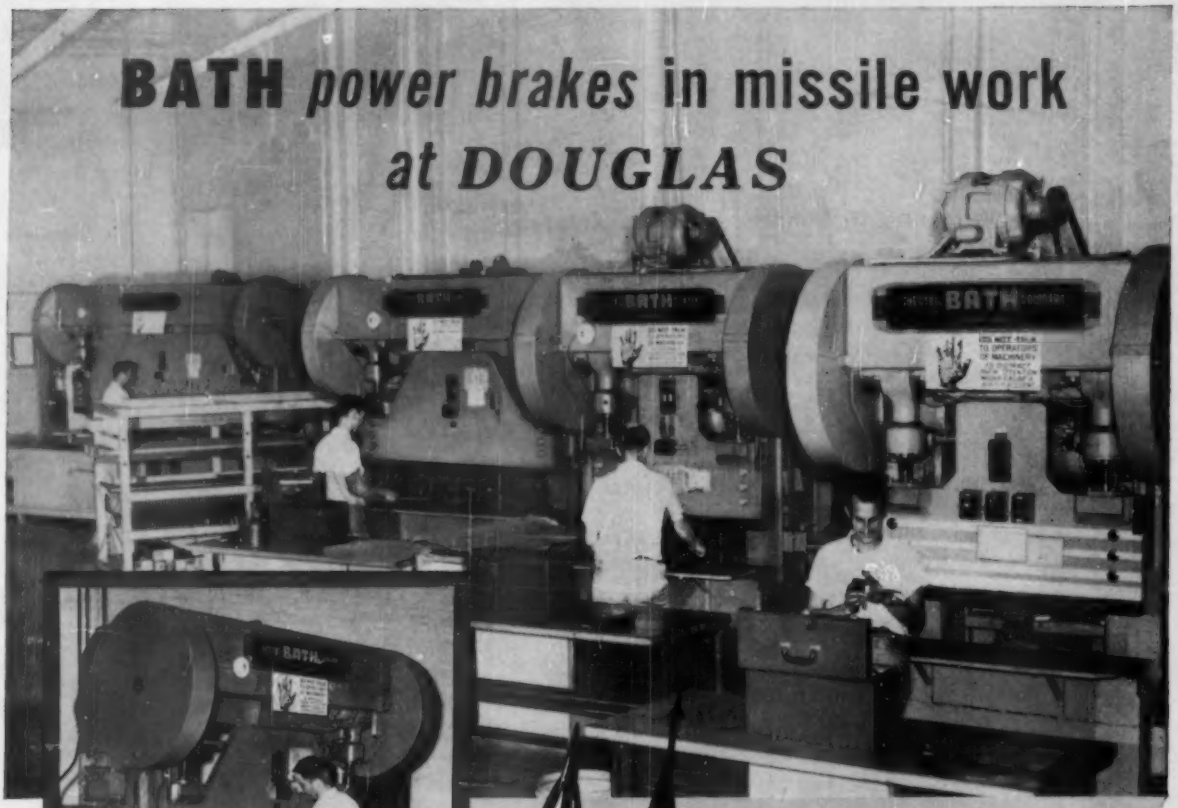
**He will certainly try** to inaugurate his four-day week by asking a time-and-a-half premium for at least part of the fifth day. The extent of that part will be a bargaining item. Pensions are due for an airing because the present maximum amount, when added to Social Security, still falls short of providing a living. This could be sacrificed in bargaining however, because Reuther looks to the four-day week as a move in the direction of steady work for his people, thus allowing them to set-up individual savings schemes to augment pensions.

**Other probable demands:** more money for the UAW's still dissident skilled tradesmen—mostly procedural improvements in the Supplemental Unemployment Benefit system; complete company payment of hospital and insurance plans; and, as a bargaining point, a shorter-than-three-year contract period.

## Canadian capers . . .

Most every Canadian was disappointed in the smaller-than-anticipated cut in that country's hamstringing excise tax. It was dropped from 10 to 7½% at the manufacturers' level, but this is not considered to be enough to stimulate sagging auto sales.

# BATH *power brakes* in missile work *at DOUGLAS*



Bath Power Press Brakes are playing their part in important missile work at Douglas, Charlotte, N. C. Other Bath Brakes are at work in missile and air frame manufacturing at Douglas in El Segundo, Santa Monica and Tulsa plants.

You'll find Bath Power Brakes and P. T. Blanking and Punching Presses performing in every important industry where metal forming is required. They are noted for sure power, accurate bends and minimum maintenance costs. One piece all-welded frames, double end drive and double reduction gearing are standard features. The patented overload release mechanism prevents stuck dies or breakage and is standard equipment at no extra cost.

Catalogs are available without obligation covering both the BATH Power Brake and P. T. Press Line . . . they cover important information regarding the facts which make BATH presses your best buy . . . And ask for the Power Press Brake Die Catalog too!

THE CYRIL BATH COMPANY

**32340 AURORA ROAD • SOLON, OHIO**
(LOCATED IN THE GREATER CLEVELAND AREA)
Manufacturers of Radial Draw Formers • Dies • Tools
Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines

# Aircraft and Missiles...

NEWS REPORT

## U S plant-leasing hassle...

Look for new ground rules covering the commercial use of government-owned facilities, including machine tools, by defense contractors. The General Accounting Office has recommended to Congress that contractors be barred from using such facilities for commercial work until the rental charges to be paid the government have been worked out in advance. The matter will be aired before a House Armed Services Subcommittee January 7.

**GAO's proposal to alter the rules** stems from a current battle between Curtiss-Wright Corp and the Air Force over close to $5 million in rental fees, dating back to 1950, that the Air Force says Curtiss-Wright owes the government.

**Curtiss-Wright has an Air Force contract** to build and test airplane engines, using government-owned machine tools mixed with its own equipment. It also builds commercial engines in the plant involved—the one at Wood Ridge, N J.

**The Air Force contends** that rental fees currently amounting to around $1.3 million a year are due the government for use of its equipment.

**Curtiss-Wright, however,** has contested the measure, which is before the Armed Services Board of Contract Appeals for settlement. Date for settlement is January 7, same day as Congress's hearing.

**Initially, Curtiss-Wright protested** the Air Force rental charges on grounds that none were due until agreement could be reached on the exact amount of rental to be paid.

**Further, C-W argued that because the capacity** of its own facilities exceeded the requirements for its commercial business, no rental was due until the commercial operations exceeded the capacity of its own machinery.

**In its appeal to the Pentagon, however,** C-W acknowledged that rental charges have accrued since 1950, but contested the amounts set.

**In an effort to spur action on the measure,** GAO has submitted a brief report on the issue, along with its recommendation, to Congressmen. One, F Edward Hebert (D, La) took a strong stand for the government, made the issue public.

**Sharply protesting in national newspaper ads,** C-W President Roy T Hurley charged that Hebert was prejudicing the Contract Appeals Board before it could reach a decision.

**Just what the Appeals Board will decide** and what changes in rental procedures will come out as a result of the Congressional hearings is hard to say. One result that is expected, however, is for the whole matter to throw more weight behind ODM recommendations to put rentals on a cash basis. Such a bill is before Congress.

**What ODM wants** is to get a revolving fund established from government-owned equipment rentals so that facilities can be modernized.

**Main opposition to this comes from the Pentagon,** because the Services like to get lower unit costs through use of government equipment—it helps them to spread appropriations farther.

## No silver lining in sight...

Aircraft industry layoffs are continuing. In the Los Angeles area they're declining somewhat, but there's no prospect that the end will come before mid-1958, if then.

**Year-end forecasts of aircraft employment** in the Los Angeles area have been dropping. **Revised last month to 195,000 from a 222,000** peak in March and April, the estimate was revised again to about 190,000 recently when California State Dept of Unemployment figures showed the level already down around 196,000.

**One bright spot in the whole picture** is Northrop's receipt of an Air Force Letter of Intent for production of an additional $70 million worth of Snark ICBM's and related equipment. Otherwise, continued employment shrinkage for primes and subs was the outlook in LA.

**Most other Los Angeles area manufacturing** is downtrending, too. Total manufacturing employment dropped from 749,700 in October to 737,600 in November—and it's expected to keep sliding well into 1958. This marked the first time figures have dropped since 1954.

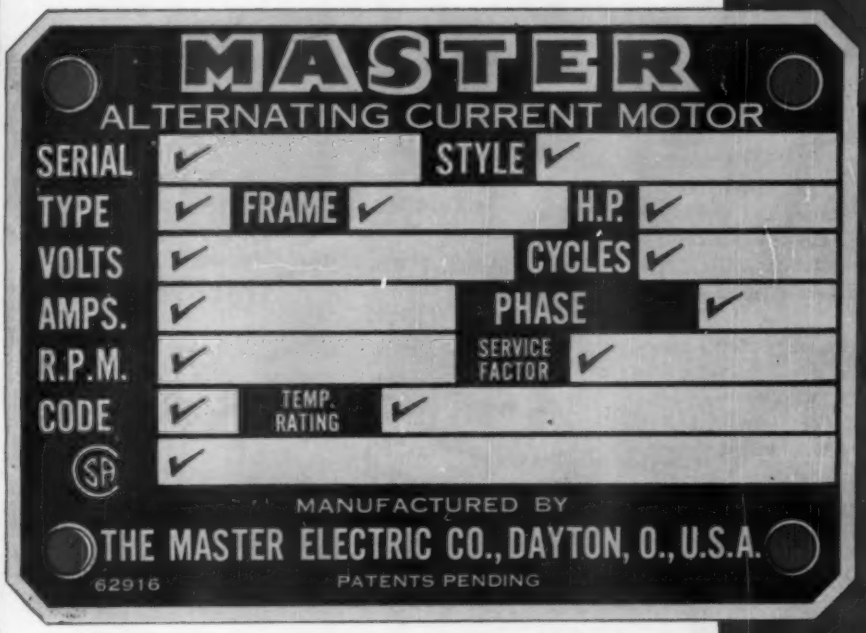
**But while caution is the watchword** among Los Angeles industries, there's little feeling of a really serious recession. As one local economist puts it, "Compared to the licking Detroit takes in a poor model year, what we're getting is pretty minor." Most area businessmen feel the post-Sputnik spending will begin to make itself felt by mid-1958, arresting the downtrend.

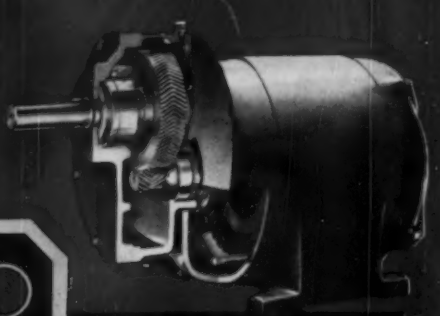
## ICBM's pegged at $2 million plus...

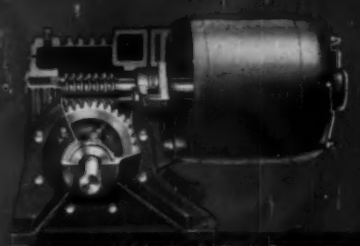
Unit production cost for an intercontinental ballistic missile will come to about $2 million when quantity output gets under way—excluding cost of R & D, capital investment and warhead. The smaller IRBMs will cost about $1 million each.

**"Successful" test firing of the Atlas ICBM** involved a flight of several hundred miles, not a full 5500 miles, and the missile lacked a nose cone, guidance gear and other equipment.

*Write your own ticket—*

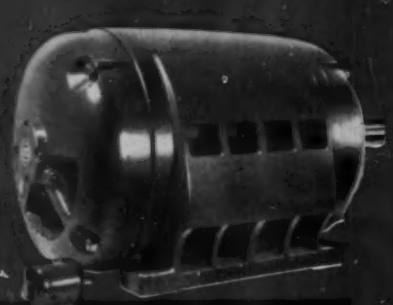




Parallel Shaft Gearmotors


Right-Angle Shaft Gearmotors

Unibrake Motors

Speedrangers


Standard Motors — ⅛ to 400 H.P.

What are your power drive requirements? Here at Master, with the widest selection in the nation to choose from, you're sure to fill your needs quickest and best.

Need something special in gear reduction—electric brakes—variable speed operation—fluid drive or special mounting? Or would some of our standard models (⅛ to 400 H.P.) fill the bill? You'll find the answer here! And remember, all Master components are engineered to form combinations of units in one streamlined, compact package of efficiency. Name your need and the name that fills it is Master—for greater salability of motor driven products; for increased productivity of plant equipment.

**Motor Ratings**..⅛ to 400 H.P. All phases, voltages and frequencies.

**Motor Types**.....Squirrel cage, slip ring, synchronous, repulsion-start induction, capacitor, direct current.

**Construction** ....Open, enclosed, splash-proof, fan-cooled, explosion-proof, special purpose.

**Speeds** .....Single speed, multi-speed, and variable speed.

**Installation** .....Horizontal or vertical, with or without flanges and other features.

**Power Drive Features** .....Electric brakes (2 types)— 5 types of gear reduction up to 432 to 1 ratio. Mechanically and electronically-controlled variable speed units—fluid drives—every type of mounting.

THE MASTER ELECTRIC COMPANY
DAYTON 1, OHIO

# Machine tools ... NEWS REPORT

## GMC Truck has program ...

A moderate-sized tooling program for GMC Truck Division of General Motors is about the only important piece of machine tool business around Detroit just now.

**The special-machinery people** have been hard at the job of trying to get their share of this program. In at least one case, a builder proposed to take the entire machining line, but GMC Truck is said to have balked at this idea.

**Other tooling programs** are being held in abeyance or are not being developed for the time being. Ford has made plain to builders its policy of making a profit in the months ahead on its very heavy investment in production equipment over the past few years. It intends to take a rest from spending more money until a real improvement occurs in the automotive market.

**Pretty much the same situation exists** in General Motors and Chrysler.

**Study of ways and means of cutting costs** in its production processes is under way at one major automobile company. It is suggesting to machine tool builders that they come in and make case studies of situations in which replacement of old equipment with new will save money. The idea is to have facts and figures ready for the time when capital spending will be resumed.

## German machines for Australia ...

The Canadian Ford company is reported to be assigned the task of buying new production equipment for a Ford plant in Australia. The story is that the transfer machines for this tooling job are likely to be bought from German machine tool builders.

**German transfer machines** have been installed in a number of British automobile and other mass-production plants. They were first developed in the early 1950's in response to a demand from Opel, General Motors' German company, and other West German automobile firms.

## Services ask revaluation ...

Two of the armed services have asked the Defense Department to make a revaluation of the modernization and replacement program for machine tools to which they are committed.

**The revaluation** would be in the light of the rapidly changing policies of the department.

**The program says** that each service branch is to spend from 3% to 5% of the original cost of its machine tools for replacements.

**Only three courses are open** to the Defense Department. It can cancel the program completely, or it can modify it, or it can adhere to its directive and insist that the program be carried out as planned.

**There is no hint** of what the Defense Department will decide. But some officials are known to favor carrying out the program without any deviation from it whatsoever.

## Machine Tool Show at Milan ...

An Italian-sponsored machine tool show is to be held at the Milan, Italy, fair grounds in September 1958. It is to be under the auspices of UCIMU (Association of Italian Machine Tool Builders) and will contain exhibits of machine tool accessories as well as machine tools.

**Italian machine tool builders** and foreign companies represented saleswise in Italy are to participate in this 10-day show. Some 110,000 sq ft of space already has been assigned.

**UCIMU is said to foster the hope** that this show will be the forerunner of a bi-yearly show that will alternate with the European Machine Tool Show, which will be staged next in Paris in 1959.

**The French are now in the final stages** of completing their huge new modernistic exhibition hall in Paris which will house the 1959 show.

**Construction of the new hall** is under personal direction of Emmanuel Pouvreau, director-general of SPMO, Parisian machine tool builder.

## Leipzig Fair in March ...

The Leipzig Spring Fair is scheduled for March 2 to 11, 1958. Once again, it will have big exhibits of machine tools, most of which will be from Russia and Russian-dominated countries. Some machines from the West, especially from West Germany, are to be on display.

**Exhibitions "of the socialist countries** headed by the Soviet Union will demonstrate the high level of technical development and the great progress made in mechanizing production," the official announcement says.

## European tools bought ...

European-built machine tools are reported to have been bought for its new Brazilian plant by a prominent U S tractor maker. The tooling is said to have run into the millions.

**Some U S machines built in Europe are included** in the purchases. But apparently no orders were placed in this country. The price factor was responsible for this decision.

Combination spar and skin miller operating at one of the country's largest aircraft plants (Name on Request). *Texaco Soluble Oil* emulsions are used exclusively in these operations.

# How Texaco Soluble Oils combine cooling capacity with anti-friction properties

Soluble oil emulsions are often considered just "coolants", whereas cutting oils, by virtue of their extreme pressure and wetting properties are selected mainly to reduce friction.

But you can combine the advantages of good cooling capacity and excellent anti-friction properties, by using *Texaco Soluble Oil.* For heavy duty operations, emulsions of *Texaco Soluble Oil HD* also contain extreme pressure characteristics which make them suitable for many machining jobs that formerly could be handled only by cutting oils.

For grinding, *Texaco Soluble Oil* emulsions fight the common tendency for wheels to load—keep machines cleaner. They emulsify readily with water—remain stable. And they provide protection against rust, even at high dilution.

There is a *Texaco Cutting, Grinding* or *Soluble Oil* to help you do better, faster machining, at lower cost. Ask your Texaco Lubrication Engineer to help you select the proper one. Just call one of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

# What's ahead ... in Metalworking

NEWS REPORT

## Operations at 93% of a year ago . . .

The metalworking industries are closing the year with operations pegged at about 93% of the level that existed when 1957 started.

**Today's physical volume of production** is almost equal to that of two years ago, when Metalworking was congratulating itself that it had attained a new peacetime peak.

**Though no final figures are at hand,** it is an assured fact that Metalworking set a new record the past year.

**There is scarcely a doubt,** however, that in the next 30 days metalworking operating rates will be retreating instead of advancing or even standing still. The decline will be gradual, not abrupt.

**The giving of ground** will be traceable to the serious decline in backlogs and the failure of new orders to turn upward in capital goods.

**Industrial machinery makers** in general, and the production equipment builders in particular, are in a bad spot at the moment. And no immediate improvement looms.

**The disappointing sale of new car models** has had a chilling effect upon automobile production. It has made car manufacturers cautious in their commitments for almost everything.

**Steel mills report a further drop** in new orders, with the unsatisfactory Detroit situation contributing notably to pulling down the tonnage.

**The tool and die people** have had a slight upturn in production. But they are ending the year below the volume of work delivered to customers in 1956.

**More than that, incoming business** has nosedived, with the total down more than one-third from that of a year ago. Contract shop owners take a rather dim view of the outlook the next few months. They still are expecting some major tooling programs for 1959 car models. But orders have not yet materialized.

## Steel castings off . . .

The trend in steel castings is no different from other industries. Production is sliding, with the December figure lower than November and considerably down from last year.

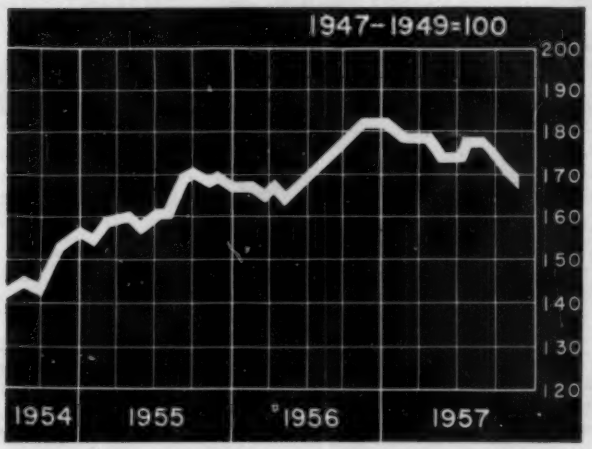
**Even so, new orders** have not caught up with output, and backlogs are dwindling. The oil and refinery fields are currently the best source of business.

**Steel foundries hope to benefit from** the road-building program. But not until midsummer at the earliest.

**Appliance makers feel** that they may achieve a modest gain in 1958 sales. TV set manufacturers also are more optimistic than they were. Retail sales recently have shown a nice pickup.

**Companies producing heavy electrical equipment** (turbines, generators, transformers) expect 1958 to be a good year.

**Makers of office machinery** are furloughing employees right and left "to bring production in line with current sales." One major manufacturer is laying off 3300 employees for this purpose for 60 days, another has furloughed 400. But these layoffs are temporary. Most affected lines: manual office typewriters, and adding machines.




167

**AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION**

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

| | DEC. Estimated | NOV. Preliminary | OCT. Revised | NOV. Year Ago |
|---|---|---|---|---|
| **Total Index** | **167** | **168** | **169** | **180** |
| **Machinery** | 141 | 146 | | 155 |
| **Electrical Machinery** | 198 | 194 | | 219 |
| **Autos** | 154 | 118 | | 151 |
| **Other Transportation** | 289 | 346 | | 330 |
| **Other Metalworking** | 143 | 142 | | 144 |

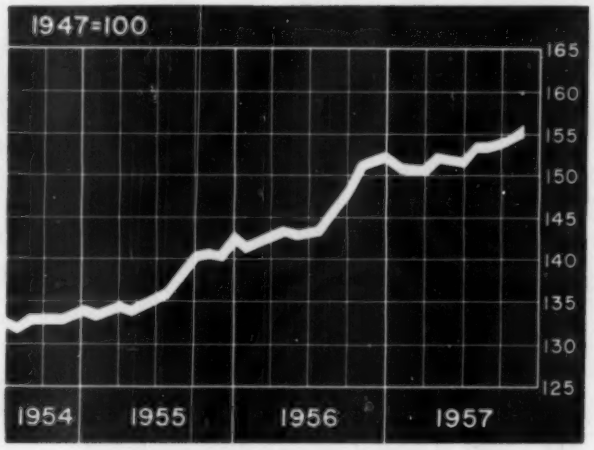
NEWS REPORT

# What's ahead: . . . in Business

**AMERICAN MACHINIST INDEX OF METALWORKING PRICES**

| | DEC. Estimated | NOV. Preliminary | OCT. Revised | NOV. Year Ago |
|---|---|---|---|---|
| **Total Index** | **156.0** | **155.8** | **154.7** | **150.8** |
| **Metalworking Machinery** | **183.8** | **182.4** | **174.1** | |
| **Other Machinery exc. Electrical** | **165.8** | **165.1** | **158.5** | |
| **Electrical Machinery** | **156.9** | **156.9** | **151.2** | |
| **Fabricated Metal Products** | **145.7** | **144.9** | **143.3** | |

156




## A gentle dip through the first half of '58?

Financial and economic experts by now are pretty well agreed that there'll be no decided business upturn before the third quarter of 1958.

**But neither will there be** any sizable further turndown, in the near future. Rather, business can anticipate that the current sideslip will go on until the national economy has readjusted itself to rapidly changing financial and economic conditions.

**Steel output,** a gage of forthcoming industrial production, is expected to fall off, but only slightly, in the first half of 1958, then to pick up again in the second half.

**Housing starts,** because of a slight loosening of the tight money situation, will pick up a little but industrial programs will decline.

**Highway construction,** with the first money alloted under the Federal Highway Program, will definitely pick up next year.

**Farm equipment sales will hold their own in '58.**

**Retail sales,** down from mid 1957, aren't expected to pick up much before second half 1958.

**Railroad carloadings** could drop off as much as 10% from early 1957 levels in the first quarter, but they're expected to pick up after that.

**A recent survey of purchasing agents,** who represent virtually every U S industry and business, comes up with this outlook for first half 1958: most firms will experience little change in their general business situation in the next six months; prices won't fluctuate much—either up or down; the current squeeze on profits won't be eased significantly either, a major reason why capital goods expenditures won't go up before the second half, if then; unemployment will continue to grow; and trimming of inventories will go on through at least first half 1958.

**The bankers sum it all up:** there'll be no general business upturn before second half 1958.

### WEEKLY BUSINESS INDICATORS

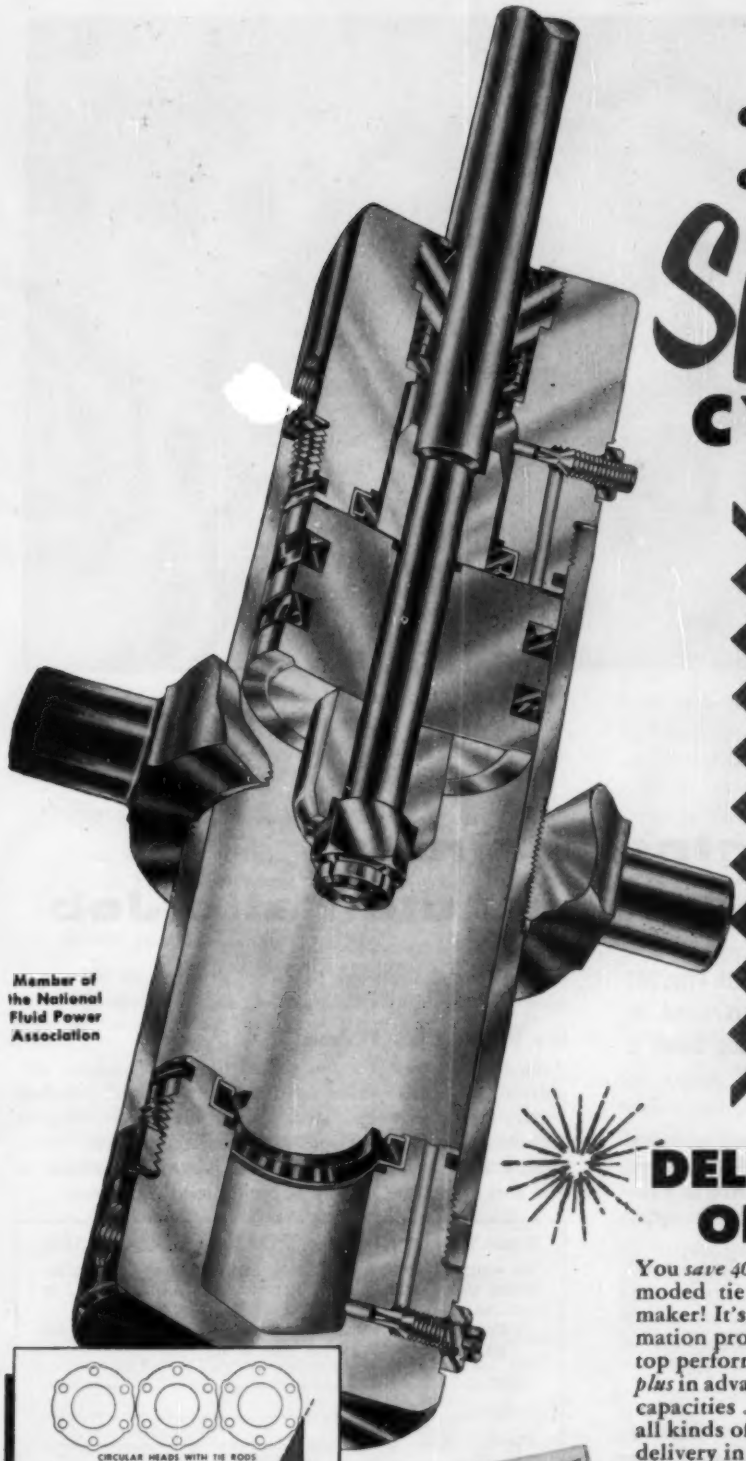
| | Latest Week | Preceding Week | Year Ago |
|---|---|---|---|
| *Business Week* Index of Activity (1947-49=100)* | 136.5 | 136.3 | 155.4 |
| Steel ingot production (thousand tons) | 1,739 | 1,770 | 2,525 |
| Electric power output (million Kilowatt hours) | 12,570 | 12,315 | 12,220 |
| Production of automobiles and trucks | 174,593 | 167,761 | 195,168 |
| Engineering construction awards (Eng. News-Record, millions) | $265.6 | $226.5 | $456.6 |

### MONTHLY BUSINESS INDICATORS

| | Latest Month | Preceding Month | Year Ago |
|---|---|---|---|
| Refrigerators sales (thousands of units) | 252 | 229 | 262 |
| Vacuum cleaners sales (thousands of units) | 303 | 241 | 320 |
| Washers sales (thousands of units) | 394 | 329 | 403 |
| Household electric ranges sales (thousands of units) | 76 | 53 | 82 |
| Radio production (thousands of units) | 1,611 | 969 | 1,319 |
| Television production (thousands of units) | 833 | 674 | 894 |
| Gear sales index (1947-49=100) | 174.9 | 225.8 | 230.5 |
| Foundry equipment new orders index (shipments, 1947-49=100) | 113.9 | 231.3 | 114.7 |

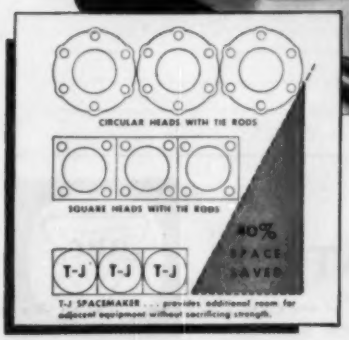
* Seasonally adjusted

# all the EXTRAS are standard with T-J Spacemaker CYLINDERS



Member of the National Fluid Power Association

- **NEW** *exclusive* ingenious cushion designs . . . Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Cushion for Oil.
- **STRONGER** than outmoded tie rod design, proven through actual tests. No tie rods to stretch.
- **SOLID STEEL HEADS** throughout the full line.
- **COMPACT DESIGN** eliminates tie rods, increasing the strength and reducing mounting space required, providing extra room for adjacent equipment.
- **HARD CHROME PLATED** body bores and piston rods . . . assure you of long trouble-free service. (Standard at no extra cost.)
- **METALLIC ROD SCRAPER,** not just a wiper, actually removes foreign matter from the rod.
- **PILOTED PACKING GLAND** with extra long bearing. Additional strength and support to the piston rod.
- **OIL** pressure to 750 p.s.i. AIR to 200 p.s.i.


CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
40% SPACE SAVED
T-J
T-J
T-J
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

## DELIVERY OFF THE SHELF!

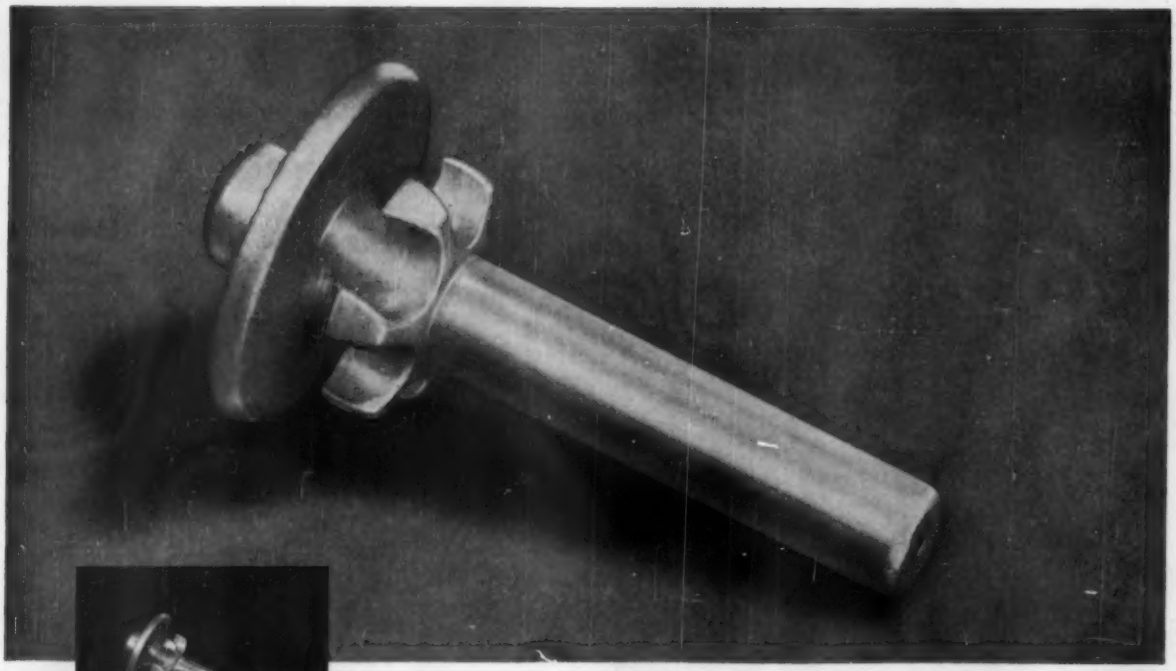
You *save 40% space* when you switch from outmoded tie rod cylinders to the T-J Spacemaker! It's stronger, too! Fits right into automation programs in countless plants. Delivers top performance and dependability with a big *plus* in advanced features. Wide range of styles, capacities . . . reduces man-hours and costs in all kinds of push-pull-lift operations. Off-shelf delivery in 64,000 combinations!

NEW LITERATURE—Send today for new Catalog SM56 with complete engineering details on Spacemaker line. Write The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
RIVETORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHORS

* Seasonally adjusted





Actual Size

# Free Machining Stainless Helps Solve Tough Automatic Job

**From bar to finished part in only 12 seconds with Type 303 stainless steel. A total of 10 operations are required, including drilling 6 semi-circular holes. Surface finish is held to 20 microinches and tolerances .002" t.i.r.**

This small part for a single lever kitchen faucet is typical of the wide variety of screw machine parts being specified in stainless steel. And it is typical of how Armco Free-Machining Stainless Steels can help you turn the toughest jobs into good profit-makers.

Among 33 standard grades of Armco Stainless Steel, there are more than a dozen free-machining grades. For almost any job you can select a free-cutting variety to help you boost production. And the uniform machinability of all Armco Stainless Steels cuts rejects and down time.

**Cost-cutting Sizes and Shapes Available**

You can make additional savings with Armco Stainless bars because they are available in a wide range of sizes in both standard and special shapes. The size you need and special shapes mean less bar stock to turn into chips . . . even the possibility of eliminating entire operations.

**New Machining Film Available**

Armco has a new 16 mm sound film that outlines recommended practices for both production and job-shop machining of stainless steel. You'll find a showing of "Machining Stainless Steel" useful in keeping costs down, quality and profits up on stainless jobs. It's available to you free of charge. Just fill out and mail the coupon.

**Armco Steel Corporation,** 1457 Curtis St., Middletown, Ohio

We would like to show "Machining Stainless Steels" on the following date _____. Alternate dates are _____ or _____.

☐ Also send us information on the available sizes, shapes and grades of Armco Stainless Steel bars.

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

**ARMCO STEEL CORPORATION**

1457 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

# Where Will You Be?

It is a good thing to face facts squarely as Metalworking enters a New Year.

The onward-and-upward movement that nurtured boom times has come to a halt. The business curve is temporarily pointing in the opposite direction.

Your volume of business will be doing well if it holds its own in the months ahead. Your labor rates are likely to be going up. Your cost of materials is not likely to head downward and may well rise. Your ability to raise prices is dubious at best. Your competition will be scorching.

## So as you go into 1958...

there is no better time to do some serious thinking about how you expect to deal with the headachy situation confronting you. Merely to sit on your hands would be disastrous.

One midwest manufacturer intends to devote a lot of attention to reducing costs and to increasing productivity per employee (the two go hand in hand, of course).

This company has a long-term labor contract that specifies automatic increases the coming year. It figures that its materials costs will go up too. The big question is how much of the added expense can be passed along to customers.

The management is not at all confident that it can pass along much. Hence the precaution of trying to shave costs and increase productivity.

Another company, realizing that it has excess capacity at present, has decided that it will not purchase any more production equipment for a while (it invested in millions of dollars of new machines the past few years). But it does not intend to do nothing.

## It plans to get ready...

for the next big cost-cutting and modernization push. It is inviting its equipment suppliers to come into its shops and look things over. It is suggesting that case studies be made wherever replacement of an old machine would pay handsome returns.

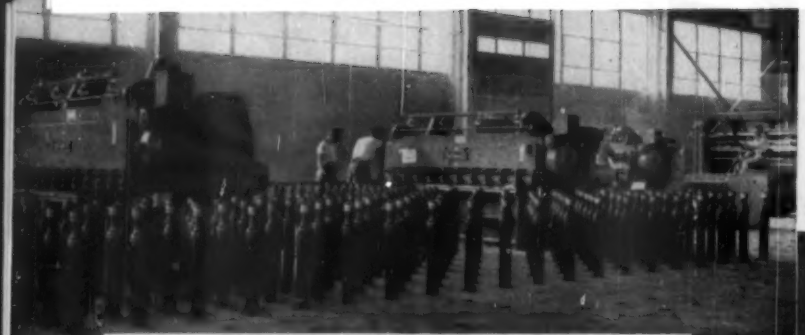
These two samples could be multiplied many times to illustrate the point that many metalworking managements are taking a close look at various phases of their operations these days. In particular, they are microscopically examining their costs, both in the shop and in the office, to see what can be done to make a reasonable profit on lower volume.

## No one welcomes...

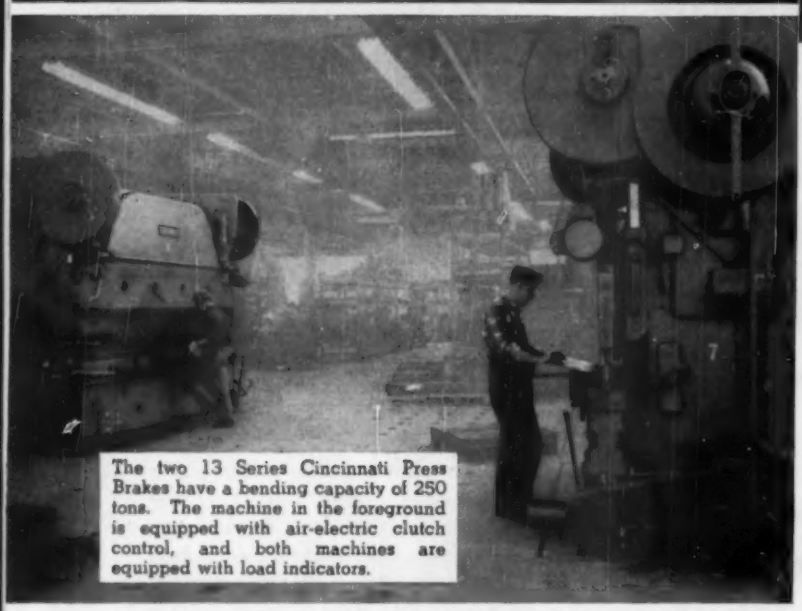
the waning of a boom. But it sometimes serves a useful purpose. It prods management to eliminate complacency and slip-shod methods and extravagances that are almost inevitable companions of easy times.

Thus 1958 may well wind up, through the force of circumstance, with many metalworking companies on a sounder and more efficient basis than at the year's beginning. The big question for you and your business is: Exactly where will you be 12 months from now?

Burnham Finney EDITOR



The 2510 Series Shear at the left has a capacity of 3/8" x 10' mild steel. The 1410 and 1406 Series Shears at the right have capacities of 3/16" x 10' and 1/4" and 6' mild steel respectively.



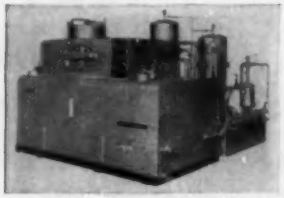
The two 13 Series Cincinnati Press Brakes have a bending capacity of 250 tons. The machine in the foreground is equipped with air-electric clutch control, and both machines are equipped with load indicators.

*Photographs courtesy Detrex Chemical Industries, Inc., Bowling Green, Kentucky*

**DETREX CHEMICAL INDUSTRIES** *say:*

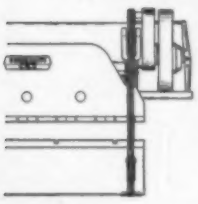
## "Our sheet metal department is built around Cincinnati Shears and Press Brakes"

Three Cincinnati Shears and two Cincinnati Press Brakes are operating profitably in this finely equipped shop. All of the sheet steel parts needed to fabricate an entire line of drycleaning equipment are produced on these versatile machines. The materials range in thickness from No. 16 gauge to 3/8".

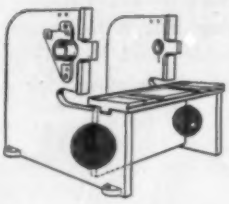


This two-bath Ambassador Model 600S drycleaning machine is typical of the Detrex line of quality equipment produced with the aid of Cincinnati Shaper Company machines.

**Centerline Loading** is a standard feature of all Cincinnati Press Brakes. Since working forces are contained directly in the housings, weaving of the frame and cramping of the ram slides, guides and shaft bearings are eliminated. Centerline loading makes it possible to concentrate most of the weight of a Cincinnati Press Brake in the four main members, which provides maximum strength per pound of machine. Write Department A for Catalog B-5, which gives full details.



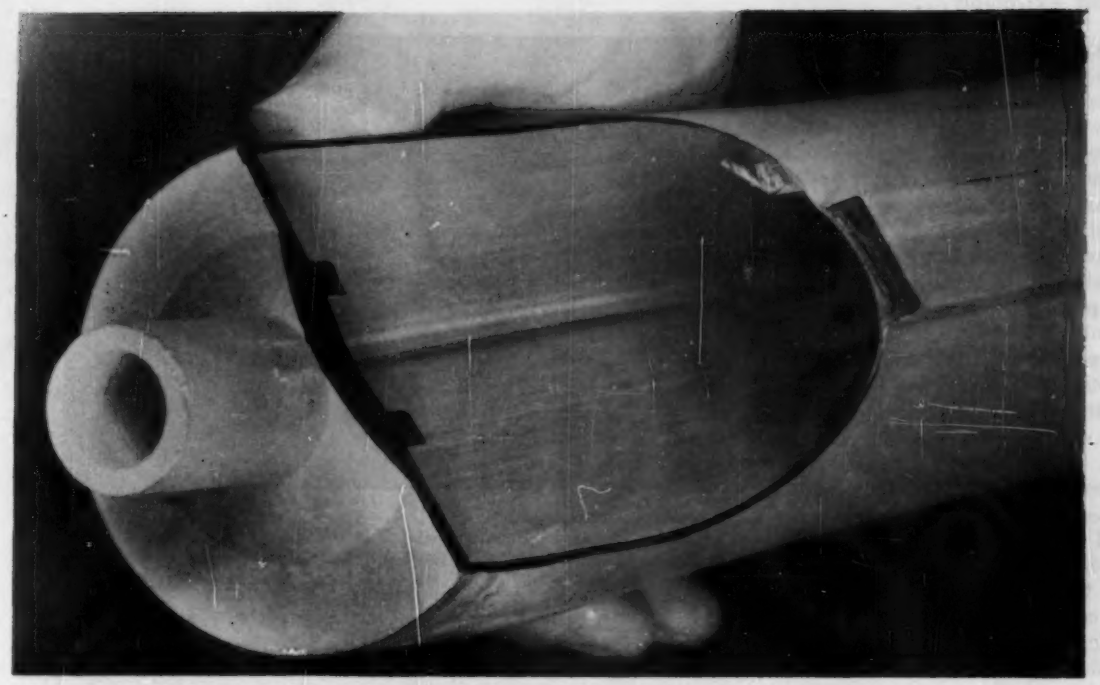
**All-Steel, Interlocked Construction** is a standard feature of Cincinnati Shears. All the main members are of rolled steel plate, yet no welds are used as load supports. In addition to eliminating strains which affect accuracy, Cincinnati interlocked construction also reduces freight, foundation and installation costs. Write Department A for catalog S-7R, which gives full details.



**THE CINCINNATI SHAPER CO.**

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES

CINCINNATI



**Aft end of the first extruded tube...**
prior to sizing to final diameter. This tube has not been sized to its final diameter and the bowed portion near the end is removed in the final sizing operation. Note the non-symmetrical cross-section and the complex end shape

# ONE-PIECE ROCKET TUBES AS: Impact extrusion depth-to-diameter ratio is 32:1

**The hornet was ready . . . a 2.75-in. Mighty Mouse rocket. Now the challenge was to package this little weapon with the giant sting into the Navy's fastest fighter, our F8U-1, at the lowest cost and the least weight. With the help of the Hunter Douglas Aluminum Corp, Riverside, California, the problem was solved by an impact-extruded rocket-launcher tube. As the story shows, development wasn't easy. The possibilities are far-reaching**

JOHN R SAUL,
producibility engineer
CHANCE VOUGHT AIRCRAFT, INC,
DALLAS, TEXAS

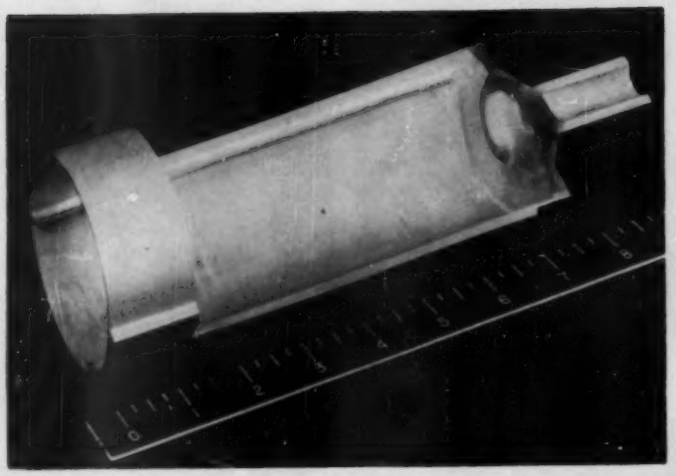
equirements of the F8U-1 design called for the rocket pack to utilize the closed-breech, forward-vented principle of launching the "two-seventy-fives." Weight and cost problems thus were multiplied before the design actually reached the board.

The logical approach was assembly of an extruded tube with a cap at its aft (or breech) end. This was a relatively common technique which would not require any manufacturing development effort—at least it appeared that way. Thread the end of the tube and the cap—screw them together and you had a rocket launcher. The one-piece tube and cap was only a dream.

The first set-back occurred when 6063 aluminum was specified because the material had to be weldable and the wall thickness would not permit extrusion of 6061. Type 6063 provided the highest strength. The second shock came when we found that the extrusion wall-thickness requirement was 0.030 in. less than the manufacturers could extrude from a die. Machining each tube to remove the excess material would be too costly and quite impractical for a tube of that length and wall thickness. Yet there was a weight penalty of more than 30 pounds per airplane to be reckoned with. We decided

to take the weight penalty for the time being. A new production process called chem-milling was in the wind and it might be just the answer to the weight problem.

Extrusions were ordered and testing began at our recently completed rocket-firing butt. Test work started more slowly than was anticipated. Manufacturing was having problems in producing the assemblies for testing. Cutting the buttress thread, used to hold the end cap in place, in the tube was the source of the difficulty. The tube was too long, roundness was poor, clamping was difficult, and there were a number of other problems. Manufacturing Research entered the picture at this point with a proposal to swage the threads into the tube. If practical, this idea could save many hours in the fabrication of each set of tubes. But the method was new at Chance Vought and there were many difficulties—such as springback.



**Internal detail . . .**
of the aft end of the Hunter Douglas 2014-T6 cold-impact extrusion indicates both the difficulty in producing this kind of part and the number of elements that can be combined by extrusion to provide an integral unit

#### TRIED CHEMICAL ETCHING

Meanwhile, attempts were made to apply the new process of chemically etching the outside of the tubes to reduce wall thickness. Although the process had been known for many years, development of techniques to provide consistent parts in production was relatively new, as was proper masking practice. One of the properties of chemical etching is its so-called "preferential attack" on material. Etchant will eat away at a constant rate as long as the material does not vary in consistency. If there is any variable in the material such as a crack or void, the etchant will seek it out immediately and amplify it.

In rocket tube extrusion this was a disadvantage. The tube was extruded through a porthole die, a name used because the center portion of the die, which forms the hole, is attached to the outer die at three points similar to a port hole on a ship. Material is extruded around this portion and rejoined beyond the die, to form an almost invisible seam along the entire length. Almost invisible, that is, until the piece is placed in an etchant solution which immediately attacks any imperfection in the seam and enlarges it, thus weakening the tube. Except for this problem, chem-milling proved practical as one answer to removal of the excess weight.

We decided to order a new type of extrusion die for the tubes: a mandrel design which would eliminate the seam and permit chemical etching without its disadvantages. Improved threads were being swaged into the ends of the tubes and it seemed that the difficulties would be overcome. On the test range, however, results were not so good. Trouble was experienced even with the best of threads.

Rocket firing pressures expanded the tubes during firing and this reduced the amount of thread overlap. An extreme example happened one day when the tube expanded enough to permit the rocket fin retainer "picture frame" to be blown partially through the gap between the tube and the end cap. Because of these effects, the threaded connection was changed to a welded joint, to prevent such occurrences.

An integrally formed end cap in the rocket tube had been sought from the beginning but there seemed to be no manufacturer capable of doing the job without a long development period at high cost. Then, in mid-summer of 1956, the work of the Hunter Douglas Aluminum Corp (a subsidiary of Bridgeport Brass Co) was brought to the attention of our Design Producibility Group. Staff engineer S K Hodgson, who had been following this project closely, presented the local Bridgeport Brass representative with a proposal for an impact-extruded tube with an integral end cap. This extrusion would differ from Hunter Douglas' previous work in a number of ways:

a. The piece would have to be over 8 ft long and about 3 in. in dia, a ratio of 32 to 1.
b. This tube would have to be thin—about 0.050 in. wall thickness, straight within 0.060 in. and with a maximum twist of 0.120 in. from end to end.
c. The cross-section was not constant. Three internal guide rails (or ribs) having different widths had to be extruded in the tube, along with an external rib so the tubes could be joined into pairs.
d. The material had to be a high-strength aluminum alloy.

Previously, the rocket tubes had been welded together, at intervals along their length, to form a rocket-clip assembly of two tubes. Within a week, Hunter Douglas had a preliminary drawing of the impact-extrusion tube design. In addition to the internal rails, the

tube also had the external rib, which would be machined into a dovetail fit and pinned to assemble each rocket clip. Hunter Douglas proposed that the material be either 7075-T6 or 2014-T6 aluminum. Samples of the dovetail were made and tested. It appeared that this was the ideal lock. All that was left was to extrude the tube. If it proved successful, a cost analysis indicated a large saving.

By the end of August, the liaison between Mr Hodgson and Mr R S Quadt, Director of Research and Development at Hunter Douglas, resulted in an improved design which called for even thinner wall thicknesses and closer tolerances than were thought possible:

| | |
|---|---|
| Rocket land ID tolerance | ± 0.010 in. |
| Wall thickness | 0.046 ± 0.004 in. |
| Bow within | 0.06 in. TIR |
| Twist within | 0.100 in. along entire length |

Estimates indicated that the first tube assemblies would be shipped on December 15, five months to the day after this "impossible" idea was first presented. A sample of an unsized extruded tube was completed and shipped later in November.

Utilizing the "forward-extrusion" process, the rocket tube is extruded cold from a partially formed billet of 2014 material. After extrusion, each tube is sized to provide the final diameter and to remove any bowing resulting from the extrusion or heat-treating processes. The non-symmetrical configuration of these tubes presented several serious problems to Hunter Douglas. Lack of symmetry in the cross-section greatly intensified side loads on the extrusion punch and die, requiring a considerably different approach to die design and construction than would be used for a symmetrical part. Innovations in material selection and tooling practices successfully minimized these eccentric loads, bringing tooling stresses within allowables.

**Rocket-clip assembly . . .**
for the Crusader, consisting of two launching tubes per unit, is shown with the developers of the impact extrusion process, Mr R A Quadt (right) VP and Director of Research & Development for Hunter Douglas Aluminum and Mr S K Hodgson (left) Staff Engineer for Chance Vought Aircraft. Critical tolerances plus the large ratio of depth to diameter created what seemed an impossible bottleneck

### PROCESS PROBLEMS

A second major difficulty was encountered after the initial tubes were extruded and the sizing operation was attempted. Again, the non-symmetrical configuration in a tube 100 in. long caused serious bowing after heat treatment and normal sizing. Hunter Douglas developed an entirely new approach to sizing non-symmetrical shapes such as the rocket tube, which had not been anticipated.

The Chance Vought tests showed the rocket tubes to be metallurgically sound in all areas, with tensile properties exceeding specification requirements. A minimum pressure of 1200 psi had to be applied to the sample tubes before they burst. Production tubes are now tested at 1400 psi. All of this indicated a very practical process, highly successful in the first application of its kind having such stringent requirments.

Quantity production of the complete rocket clip was begun and the first assemblies were submitted to test at the Chance Vought rocket-firing butts. The dovetail construction required close coordination of tool design at Hunter Douglas in both extrusion and machining. The necessity for retaining a minimum tubular wall adjacent to the heavy outer rib caused unexpected difficulties in the beginning, but the problems were solved and the packs are in production.

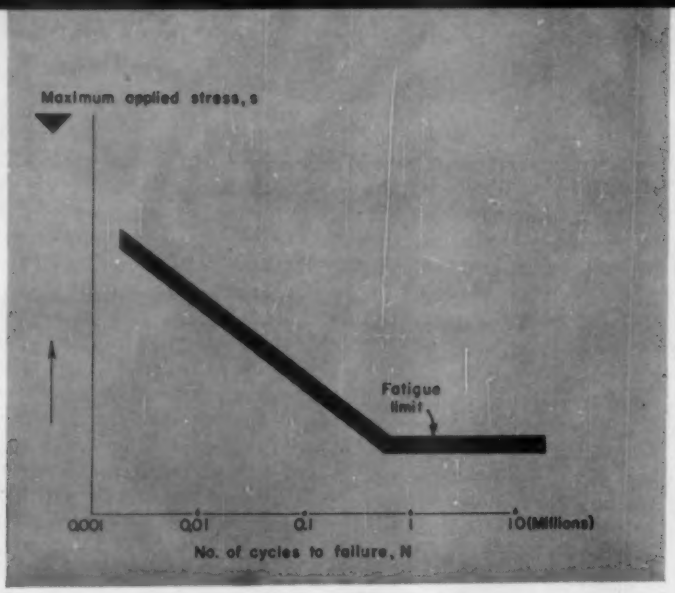



FIG. 1 . . . Schematic S-N curve for steel

# How grinding affects fatigue strength

L P TARASOV, Research & Development Dept, NORTON CO, WORCESTER, MASS

**Recent studies of grinding and fatigue strength show signs of upsetting established theories of the effect of grinding on the fatigue strength of steel. They also raise the possibility that the *control* of grinding stresses may actually *increase* fatigue strength. A complete report of the work was recently made to the American Society of Testing Materials. Because of the significance of these studies to the entire metalworking industry, we have asked Dr Tarasov to prepare this simplified explanation of the study and its conclusions.**

*—The Editors*

Any metal will fail at a lower load when the load is fluctuating or repeated than when it is constant. Failures associated with variable load conditions are said to be due to fatigue. They generally appear to be brittle and are likely to occur without warning unless the parts are inspected periodically for minute cracks that start forming some time before fracture takes place. A typical example familiar to everyone is a spring which breaks suddenly after many repeated deflections well within its elastic limit. Fatigue is of great practical importance because experience has shown it to be the most common source of failure of machine and structural parts.

The greatest applied stress (load per unit area) that can be sustained for a given number of cycles without fracture is known as the fatigue strength. The lower the applied stress, the greater will be the number of cycles before failure occurs. For steels, there is usually a limiting stress, known as the fatigue limit, below which failure will never occur. In practice, it has been found that if a steel test bar does not fracture in ten million stress cycles, it probably never will fail at that stress level, and the fatigue limit for steel is commonly determined on the basis of test runs that stop at that number of cycles if failure has not already occurred. A typical fatigue or *S-N* curve for steel is shown schematically in Fig. 1, in which the maximum applied stress *S* is plotted on semi-logarithmic paper against the number of stress cycles.

The fatigue limit of steel test bars, carefully prepared, of a round cross section, and tested in bending while rotating, is very close to half their tensile strength as long as this is below 200,000 psi or thereabouts. However, fatigue properties can be affected to a marked degree by a variety of factors that have relatively little effect upon the tensile strength. Notches, cracks, sudden changes in section, rough surfaces, nonmetallic inclusions, and corrosion pits can raise the local stress far above the average applied stress, and hence are called stress raisers. Any stress raiser is likely to have a bad effect upon the fatigue properties.

Distinct from these essentially geometrical factors is the physical condition of a thin surface layer, which can also change the fatigue properties, but in this case the effect may be either beneficial or detrimental. Shot peening is a well-known example of an operation which can strengthen the surface and improve the fatigue properties even though the surface is rougher than before.

## RESIDUAL STRESSES

One explanation of this strengthening is that it is due to the residual compressive stresses intro-

duced into the surface layer by the peening action. A residual stress is an internal one that can be caused by plastic deformation, which changes the distances between the atoms by a fraction of one percent. When they are closer together than they would be in an equilibrium condition, as in the fully annealed state, the residual stress is compressive; when they are farther apart, it is tensile. Another explanation attributes the strengthening to cold work, at least in part, and this point of view will be discussed later.

It has generally been assumed that a residual stress has the same effect on the fatigue strength as an externally applied constant stress of the same magnitude. It has been established that when the constant external stress is tensile, the magnitude of the alternating stress required for fatigue failure is reduced by a fractional part of the constant stress. When the constant external stress is compressive, there is a corresponding increase in the alternating stress required for fatigue failure. On the assumption that a residual stress is equivalent to an external one, a residual tensile stress should reduce the fatigue limit and a compressive one should raise it.

## GRINDING STRESSES

Until a method was developed for measuring the residual stresses generated by grinding, it was accepted on the basis of many years' practical experience that good commercial grinding practice did not have any harmful effect upon fatigue strength. In fact, since grinding was a method of producing a good finish, which was known to be beneficial from the fatigue standpoint, it was considered likely that the fatigue properties of manufactured parts were improved by grinding.

About fifteen years ago, however, Almen (1) found some extremely high residual tensile stresses in a surface-ground strip of annealed spring steel. The calculated tensile stress at the surface was so high that it was assumed that the surface must have been heated to a sufficiently high temperature during grinding to harden upon cooling. Thus this specimen was hardly representative of normal commercial grinding practice, but despite this the idea became prevalent in some quarters that all commercial grinding necessarily resulted in tensile stresses.

During the next decade, several other experimenters reported grinding stresses to be tensile. Even though the grinding conditions were very poor in one instance and were not stated in another, the results served to reinforce the general opinion that grinding stresses were always tensile. More recently, however, a number of investigators have definitely established that grinding stresses can be compressive at the surface as well as tensile (2-6), depending on the material and the grinding conditions. In a number of cases, it has been observed that both compressive and tensile grinding stresses are present simultaneously in adjacent layers, and under such circumstances there is no satisfactory way of predicting how the fatigue strength might be affected.

## JOINT RESEARCH PROGRAM

In order to determine what relationships might actually exist between grinding conditions, residual stresses, and fatigue properties, a research program was set up in which identically processed test bars were used for both stress and fatigue studies. The stresses were evaluated by Letner at the Mellon Institute of Industrial Research as part of a broader investigation sponsored by the Grinding Wheel Institute. The fatigue studies were performed at the Battelle Memorial Institute under the sponsorship of Norton Company where all the test bars were prepared. These fatigue studies (8) were a continuation of an earlier project (7) on the effect of grinding severity upon the fatigue strength, in which it was shown that gentle grinding had no detrimental influence but that very severe grinding, in which much too hard a wheel was used, reduced the fatigue limit by something like 25%.

## PREPARATION OF TEST BARS

A wide range of surface grinding conditions was investigated, including those typical of good commercial grinding practice. The finished test bars, made from a ball-bearing steel (modified AISI 52100 type) hardened to 59 $R_c$, were 0.120 in. thick and of the shape shown in Fig. 2. Each test group consisted of about sixteen bars, one being used for the determination of residual stress and the others in the fatigue test.

The conditions held constant in the final grinding operation were the wheel speed (6000 sfpm), the table speed (60 to 65 fpm), and the unit crossfeed (0.050 in. after each table traverse). The bars were ground lengthwise so that the grinding scratches were *parallel* to the applied stress and thus did not affect the fatigue strength. Any change in the fatigue strength with a change in the grinding conditions was due only to the corresponding change in the physical condition of the surface and not to any change in the surface roughness which may also have occurred. When the grinding scratches are *perpendicular* to the applied stress, the fatigue strength is likely to be lower for a rough surface than for a smooth one. In this case, the fatigue strength would be affected not only by the physical condition

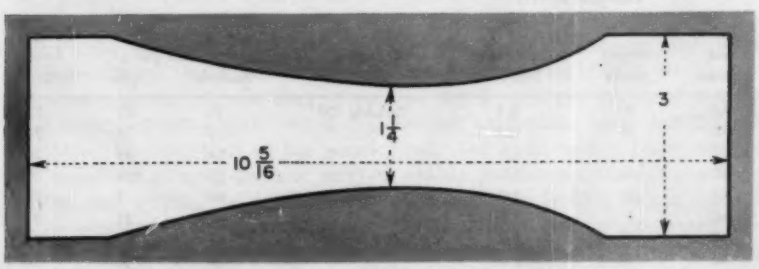



FIG. 2 . . . Fatigue test bar, 0.120 in. thick

of the surface, but possibly also by its roughness.

The variable grinding conditions involved the wheel grade, the unit downfeed, and the grinding fluid. The wheels were 8 in. dia and ¾ in. wide. They were white, vitrified bond, friable aluminum - oxide wheels in 46 grit and H, I, or M grade, a representative specification being 38A46-H8VBE. The I-grade wheel is one that might normally be used for surface grinding hardened steel. The M grade is much too hard for this type of grinding but was used in order to provide extremely severe grinding conditions conducive to the generation of high tensile stresses. The unit downfeed after each completed crossfeed was 0.0001, 0.001 or 0.002 in. The grinding fluids included two soluble oil emulsions and two sulfochlorinated oils.

#### TEST METHODS

Careful metallographic and microhardness studies showed that even the most severely ground bars were heated in grinding only enough to soften a thin surface layer slightly but not to reharden it. There was also definite metallographic evidence that an extremely, shallow surface layer was cold worked by some of the grinding operations.

The residual grinding stresses were determined by a widely used method based on the observation that a thin strip bends when the residual stress in it is changed by some means. For example, when a strip is shot peened on one side, a thin layer at the surface becomes residually stressed in compression, causing the strip to bend until the stresses set up in the rest of the strip by the bending action just balance the residual stresses. In this instance, the peened surface becomes convex. Likewise, removal of the residually stressed layer causes the strip to flatten out. If extremely thin layers of uniform thickness are successively removed by carefully controlled etching, and the corresponding changes in curvature are measured, the residual stresses that were originally present can be calculated. The grinding stresses were obtained in this manner from 1¼ x 1¼-in. specimens cut from the narrow center portions of the test bars, the etchant being a 10% solution of concentrated nitric acid in alcohol or water.

The fatigue tests were conducted by bending the test bars mechanically at a frequency of 1600 cycles per minute, the desired applied stress being obtained by controlling the amount of bending. The test bars were subjected to reversed bending, so that each side was alternately stressed equally in tension and compression. After a few bars in a group were tested at high applied stresses to obtain the sloping portion of the S-N diagram (Fig. 1) and thus to establish approximately the fatigue limit, the rest were then tested in the region of the fatigue limit. Although the S-N diagram is represented in Fig. 1 by two lines for simplicity, actually the experimental points always fall within a band extending on both sides of the lines. Thus there is a range of applied stress in which some bars fail within ten million cycles while others do not. For convenience in comparing results, the fatigue limit is generally defined in experimental studies as the applied stress at which half the bar would fail and the other half would not if sufficient bars could be tested. With the limited number of bars available in each group, it was necessary to run the tests at several stress levels in the neighborhood of the expected fatigue limit and to establish this quantity by a statistical method.

#### GRINDING STRESS DATA

Some representative curves in which the residual grinding stress is plotted against the depth below the ground surface are shown in Fig. 3. As usual, tensile stresses are positive and compressive stresses negative. The quantities of particular interest are the residual stress at the surface (actually at an arbitary depth of 0.000,050 in. below the surface, since the stress at the surface itself cannot be determined accurately) and the peak tensile stress, which was always slightly below the surface for the grinding condition investigated. These values, together with the fatigue limits and the corresponding grinding conditions, are listed in Table I. The fatigue limits depend on the shape of the test bars, among other things, and the tabulated values should not be compared directly with the much higher values that have been obtained with round specimens of hardened steel. The stress data are averages for two or more surfaces and thus do not agree exactly with the curves in Fig. 3, which are for individual surfaces.

The only difference between Groups AA and AB is that the surface grinder was overhauled in the interval between their preparation. The subsurface peak stress was essentially the same but the surface stress changed sign. It is not known whether this change can be attributed to the overhaul or if it was fortuitious. There was no significant difference in fatigue limit.

Groups AF and AG were ground the same except that the grinding oil was different, although of the same type. Here the surface stress was about the same but the subsurface peak stress was of a moderate magnitude for one oil and practically zero for the other.

If the residual stresses are com-

***Table I . . Grinding conditions, residual stress data, and reversed bending fatigue limits***

| Test group | Wheel grade | Downfeed, 0.001 in. | Grinding fluid | Residual stress, 1000 psi Surface | Peak | Fatigue limit, 1000 psi |
|---|---|---|---|---|---|---|
| AA | H | 0.1 | Soluble Oil | 13 | 23 | 73 |
| AB | H | 0.1 | " " | –25 | 18 | 70 |
| BC | I | 1.0 | " " | 34 | 49 | 73 |
| AC | M | 2.0 | " " | –29 | 122 | 62 |
| AF | I | 1.0 | Grinding Oil No. 1 | –96 | 1 | 99 |
| AG | I | 1.0 | " " No. 2 | –87 | 21 | 91 |
| AD | M | 1.0 | " " No. 1 | –67 | 12 | 73 |
| AE | M | 2.0 | " " No. 1 | –107 | 32 | 70 |

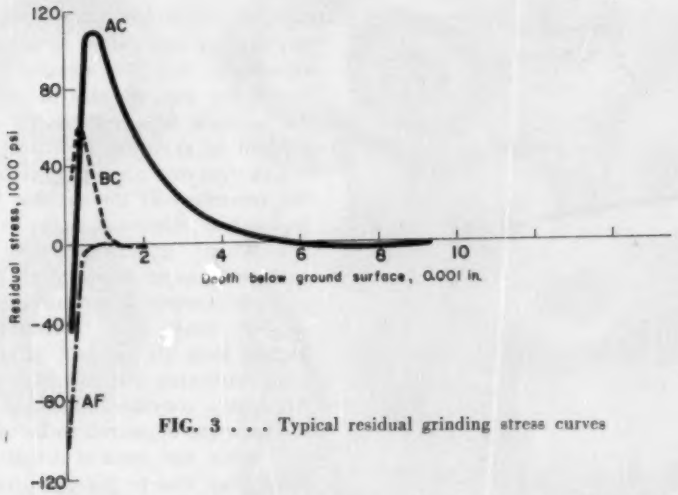



FIG. 3 . . . Typical residual grinding stress curves

pared for all the grinding conditions, it is seen that high compressive stresses were generated at the surface itself when grinding oils were used, while the peak tensile stresses ranged from negligible to moderate. With soluble oils, the surface stresses were either moderate tensile or moderate compressive, while the peak tensile stresses were moderate to high.

### GRINDING STRESSES AND FATIGUE

Although the lowest fatigue limit (for AC) was associated with the highest value for the peak tensile stress, the other fatigue limits do not bear any obvious relationship to either the surface or the peak stresses. In order to understand better the significance of these results, it is necessary to plot the fatigue limits against the peak residual tensile stress, as in Fig. 4, and to consider the locations at which most of the fatigue failures initiated in each group of test bars. Long experience has shown that fatigue failures usually start at the surface, and this has been interpreted as showing that the surface is normally weaker than the interior of the metal. However, if the surface has been strengthened sufficiently by some method such as shot peening or nitriding, then the failures start a little below the surface. The location of the point at which a fatigue failure originates can usually be determined quite accurately by examining the fractured surfaces.

In Fig. 4, the circles correspond to surface failures and the triangles to subsurface ones. It is seen that all the circles fall close to a single curve, while the triangles are considerably above it. Had the points been plotted against the surface stress instead of the peak tensile stress, the increased scatter would have made it difficult to draw a meaningful curve. Physically, the peak tensile stress would seem to be a more significant quantity than the surface stress against which to plot the fatigue limit because, according to residual stress theory, failure should start where the total stress, applied and residual, is highest in tension.

The left-hand portion of the curve is horizontal and includes the two points corresponding to extremely gentle conditions (AA and AB), which previous work (7) had shown to have no effect, good or bad, upon the fatigue limit of hardened steel. Thus this level can be thought of as the par value for the fatigue limit, with lower values corresponding to detrimental effects of grinding, and higher values to beneficial effects. The only point that drops below the horizontal portion is the one at the extreme right, obtained by very severe grinding (AC) which resulted in a high residual tensile stress amounting to about 120,000 psi. Yet even under these unfavorable conditions, the fatigue limit dropped only 13% below the par value, much less than would be predicted by ordinary residual stress theory. When the grinding conditions were changed to those representative of good commercial practice (BC), the fatigue limit equaled the par value even though the residual tensile stress was still fairly high, around 50,000 psi. This, too, is contrary to the residual stress theory, which predicts an appreciable drop in the fatigue limit for a residual tensile stress of the magnitude present.

### COLD WORK AND FATIGUE

The groups of test bars prepared with the help of grinding oils provide a clue as to why the residual-stress theory does not work. For the AG bars, the residual-stress values, both at the surface and at the peak of the curve, lie *between* the corresponding values for the AD and AE bars, as can be seen from Table I, yet the fatigue limit for AG is considerably higher than the fatigue limits for AD and AE, which fall on the curve in Fig. 4. Obviously, residual stresses cannot account for the big difference in the fatigue limits.

The only other factor capable of affecting the fatigue results under the circumstances is the cold working of a thin surface layer, which always occurs when material is removed in the form of chips. The primary effect of cold working is to harden and strengthen the surface layer by severely distorting its crystalline structure. This process is accompanied by the development of both tensile and compressive stresses within microscopically small regions. These stresses cannot cause a thin strip to bend because their effects cancel out over extremely small distances. But as a secondary effect, cold working also results in the formation of residual stresses, and these are reasonably uniform over fairly large distances along any plane parallel to the surface, so that they are capable of causing a thin strip to bend.

Strictly speaking, cold-work stresses on a microscopic scale are also residual stresses, since they remain within the material once they have been produced. However, to avoid confusion, it is best to follow general engineering usage, which distinguishes between the large-

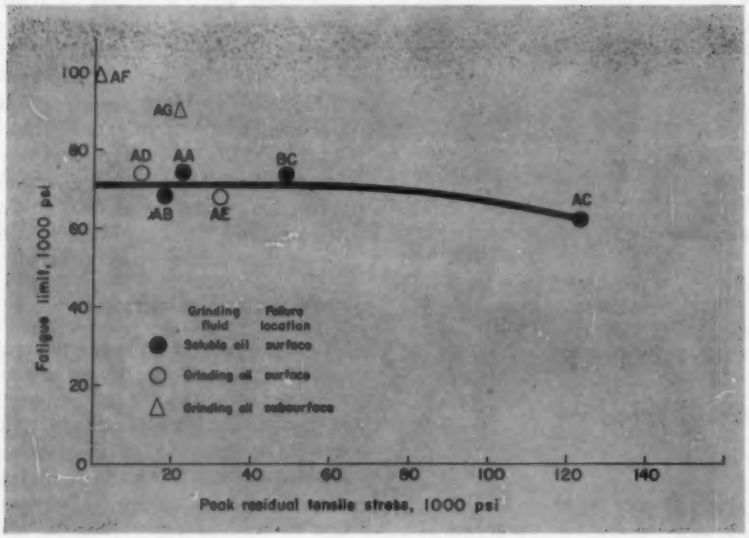



FIG. 4 . . . Fatigue limits and grinding stresses

scale residual stresses, depicted in Fig. 3, and the microscopic stresses associated with cold work.

The magnitude of the microscopic cold-work stresses can be measured only by X-ray diffraction, but a sufficiently reliable experimental technique was not available at the time of this study. Although the degree of cold work could not be evaluated, it is reasonable to explain certain results in terms of cold work when they cannot be explained in terms of residual stress theory alone since those are the only available alternatives known at present.

Thus the higher fatigue limit for the AG than for the AD or AE bars, all of which contained approximately the same large-scale residual stresses, is most likely due to differences in the cold-working of the respective surfaces. Likewise, it appears that the severely ground bars (AC) and the commercially ground ones (BC) had higher fatigue limits than expected on the basis of residual-stress theory, because the detrimental effect of high tensile stresses was partly or wholly compensated by the beneficial effect of the cold work which they received.

As pointed out earlier, the AF and AG bars were ground the same except for the brand of the grinding oil. Both the fatigue limits and the peak tensile stresses differed to some extent, and there is no way of telling whether or not the two differences were related. All that can be said is that a change in the grinding oil, even though it is of the same type, can change the grinding conditions sufficiently to affect both the residual stress pattern and the fatigue limit. In both these groups of bars, the surface was strengthened considerably by the grinding operation, as evidenced by the fact that the failures started below the surface. Whether this resulted from high surface compressive stresses, cold work, or both, is not known.

## GENERAL CONCLUSIONS

1. Good commercial grinding practice did not lower the fatigue limit even though moderately high tensile stresses were generated during grinding.

2. Severe grinding did cause a drop in the fatigue limit, but this was much less than might be expected in view of the high tensile stresses that were present.

3. Under certain grinding conditions, in which grinding oil was used, the surface was actually strengthened enough to raise the fatigue limit appreciably above its normal value.

4. High residual tensile stresses generated by grinding were associated with a much smaller drop in the fatigue limit than predicted on the assumption that residual stresses are equivalent to constant externally applied stresses. The reason for this appears to be that the surface was sufficiently cold worked in grinding to strengthen it and thus overcome part or all of the reduction in the fatigue limit that might otherwise occur.

5. When grinding conditions were such as to create high compressive stresses at the surface, the fatigue limit was considerably higher than its normal value in some instances but not in others. At least a considerable portion of the increase appeared to be due to cold work, but some of it may also have been due to the compressive stresses.

6. Residual grinding stresses in the test bars were not reduced to any measurable extent as a result of fatigue testing.

It is reasonable to expect that these results will apply to other uniformly hardened steels free from high heat-treating stresses, but they may not apply to case-hardened steels, which were not investigated. However, the fatigue limits of all hardened steels are likely to benefit from the cold working of the surface that occurs in grinding.

## REFERENCES

(1) J O Almen, "Shot Blasting to Increase Fatigue Resistance," S A E Journal (Transactions), Vol 51, pp248-268 (1943).

(2) H R Letner, "Residual Grinding Stresses in Hardened Steel," Transactions, American Society of Mechanical Engineers, Vol 77, pp1089-1098 (1955).

(3) H R Letner, "Influence of Grinding Fluids Upon Residual Stresses in Hardened Steel," Transactions, American Society of Mechanical Engineers, Vol 79, pp149-153 (1957).

(4) L V Colwell, M J Sinnott, and J C Tobin, "The Determination of Residual Stresses in Hardened, Ground Steel," Transactions, American Society of Mechanical Engineers, Vol 77, pp1099-1105 (1955).

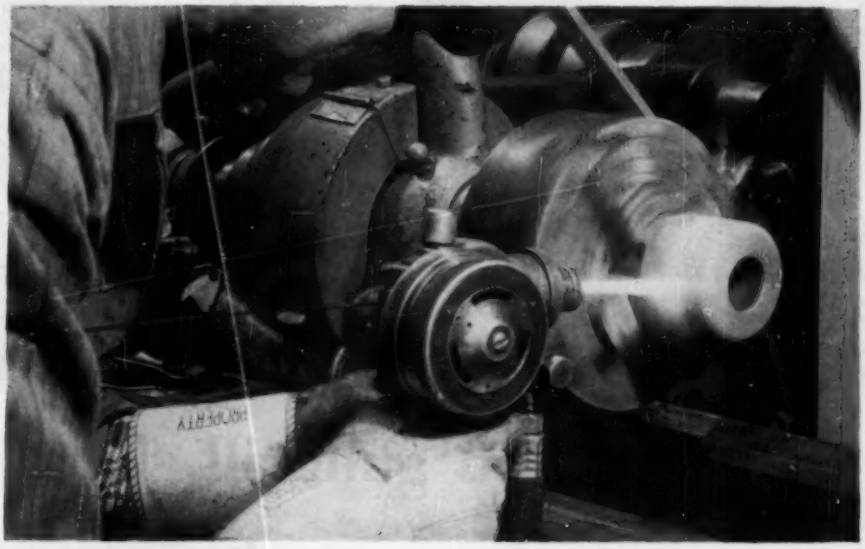
(5) P A Clorite and E C Reed, "Influence of Various Grinding Conditions Upon Residual Stresses in Titanium," Preprints No. 56-A-44, American Society of Mechanical Engineers (1956).

(6) R D Halverstadt, "Analysis of Residual Stress in Ground Surfaces of High-Temperature Alloys," Preprints No. 57-SA-62, American Society of Mechanical Engineers (1957).

(7) L P Tarasov and H J Grover, "Effects of Grinding and Other Finishing Processes on the Fatigue Strength of Hardened Steel," Proceedings, American Society for Testing Materials, Vol 50, pp668-698 (1950).

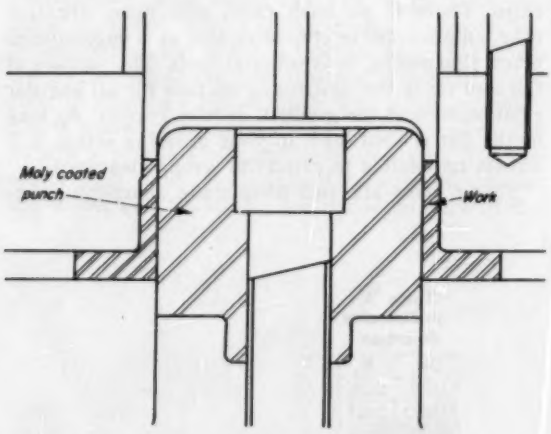
(8) L P Tarasov, W S Hyler, and H R Letner, "Effect of Grinding Conditions and Resultant Residual Stresses on the Fatigue Strength of Hardened Steel," Preprint No. 65, American Society for Testing Materials (1957).

**Flange stock is progressively blanked,** drawn, pierced, cold-extruded, sized, and trimmed in 1200-ton Verson Transmat. Trouble caused by friction between work and punch in sizing operation reduced punch life to 200-250 pc



**Metallizing setup on lathe** now sprays 0.005-in. layer of pure moly onto hardened-steel punch with Metco gun. Layer is ground down to 0.002 in., and punch is ready for installation. Life with moly coating is 50,000 pc

# 200 times the punch life with metallized moly




**Tools for sizing the flange** follow an idle station after cold extrusion. Punch sizes bore within 0.010 in., and is only moly-coated tooling member. Tooling here also sizes flange length within 0.020 in. and reduces the inside radius at the flange end. Neck decreases in length as much as 1/6-1/8 in. when bore is sized, and this action produced welding and seizing with old punches

Conventional hardened punches required too-frequent replacement at Buick Motor Div, GMC, where rear-axle housing flanges cold extruded from heavy ⅜-in. steel had to be sized. Chrome-plated punches didn't work because severe pressure from the work stripped off the plate; and carbide punches broke under these conditions. Best solution so far is metallizing the punches with molybdenum.

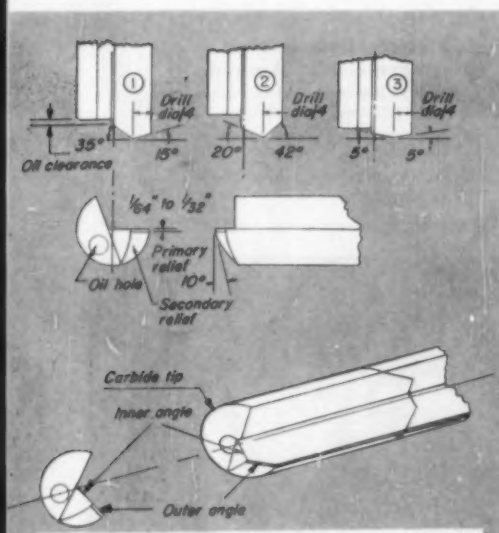
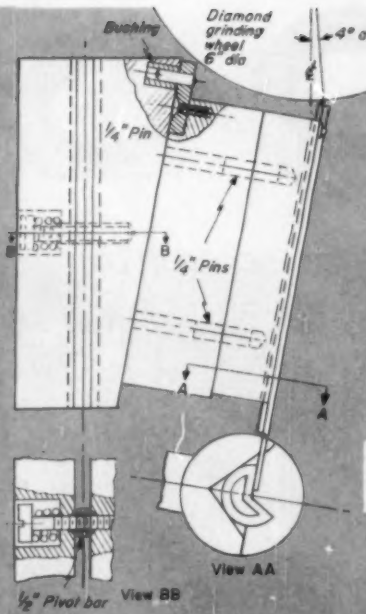



Fig. 1—Nose-grind styles...are designed to produce a certain chip shape, for ease of flushing, according to the type of material being cut.



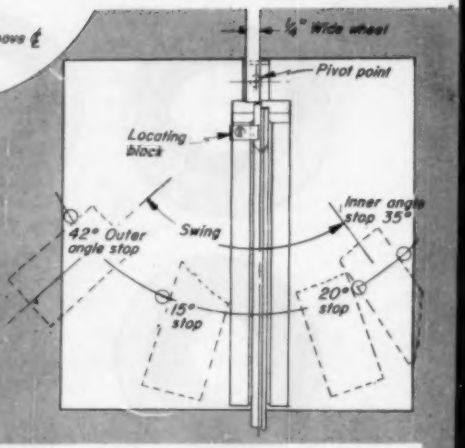




Fig. 2—Fixture design...for drill grinding with peripheral wheels. Pivot bar should permit smooth, slop-free motion of the holder from stop to stop.

# Simplified gundrill sharpening cuts

**Here, at last, are the A, B, C's of gundrill sharpening and gaging described for use in any shop in the words of a modern gundrilling pioneer. By now, after reading previous articles describing its economical possibilities, you may have used this technique or seen it in operation . . . holes from one to 250 diameters long drilled round and true . . . exactly positioned by the fixture . . . to tolerances impossible by conventional drilling and reaming practice. Now we can describe the sharpening techniques that once were puzzling**

Among the advantages of gundrilling is a simple, inexpensive method of sharpening. The configuration of the gundrill nose may seem unusual at first, but all that must be remembered is that the tip which does the cutting is simple. In fact, it is simpler than most other cutting tools. Sharpening is accomplished by grinding two cutting angles with primary clearances, then secondary clearances of the outside angle to avoid heeling, plus a setback to allow cutting oil to flow back into the flute to push out the chips. There is no back rake, side rake, negative rake, chipbreaker or chip separator as is encountered when sharpening conventional tools. The surface of the tool tip is the controlling surface for all angular relationships of the gundrill or tube reamer. As long as the flat is held level in your grinding setup, it is almost impossible to grind the wrong clearance.

Shown here are two homemade sharpening fix-

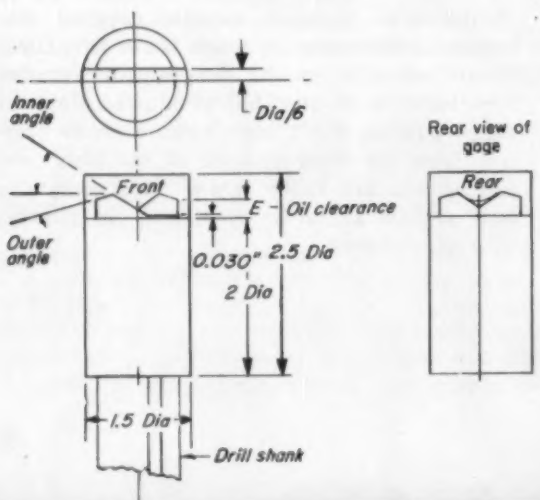



Table "A" oil clearance dimension

| Dia. | E |
|---|---|
| 0.125 | 0.06 |
| 0.250 | 0.07 |
| 0.375 | 0.09 |
| 0.500 | 0.12 |
| 0.625 | 0.16 |
| 0.750 | 0.19 |
| 0.875 | 0.21 |
| 1.000 | 0.25 |

**Fig 5—Nose-grinding gage**

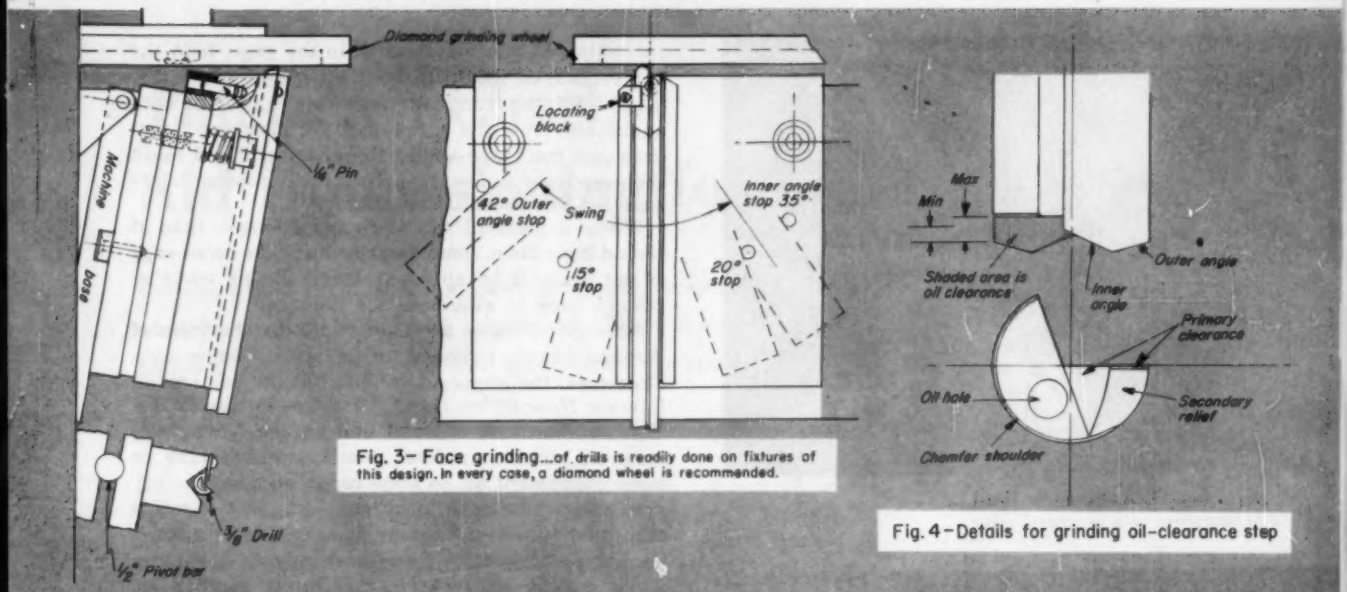



Fig. 3– Face grinding...of drills is readily done on fixtures of this design. In every case, a diamond wheel is recommended.

Fig. 4–Details for grinding oil-clearance step

# production delays

FRED BLOCH, President
ELDORADO TOOL & MANUFACTURING CORP MILFORD, CONN

tures that virtually anyone can make in his own shop. Fig. 2 shows the fixture used with a peripheral grinding wheel, preferred because the diamond wheel is easier to keep dressed hence is less bumpy to use. The fixture in Fig. 3 utilizes a face wheel. For either setup, the wheel should be a diamond wheel of 180 to 320 grit. Each fixture consists of a V-block with a locator stop to level the flat. The V-block rests on a riser block, which has the proper primary-clearance angle, and can be made in two parts as shown, with a spring-loaded rocker in between. When the block is rocked back and forth lightly, the tip of the drill is wiped across the wheel face, to produce a better finish. The whole assembly pivots sideways to produce the cutting angles. The fixture is simple and inexpensive to make. The operator just slides the gundrill forward to contact the wheel and thus sharpens the worn edge of the tool. A few thousandths of an inch are all that are needed to do it. The drill can be held in the V-block by hand.

### A SIMPLE SIGHT GAGE

Take any piece of screw stock, at least four drill diameters long. Gundrill the stock 3½ diameters deep, or twist drill and bore to gundrill size to 3 diameters deep on a lathe. Next, mount the gundrill in the tailstock and carefully feed in the drill (with your desired grind on it) just enough to bottom the hole, forming the profile of the gundrill. Be sure to use a light feed and ample cutting fluid.

Mill the blind end to the centerline of the hole (axis) in front. Then mill enough stock at the back to leave 1/16 to 1/8-in. thickness of the sight-blade. The depth of location of this step will be the maximum tolerance for the oil clearance shoulder. To

**Fig 9—Sight gage...**
Front of gage is marked with proper angles for gundrill nose and drill diameter so that the proper gage is used

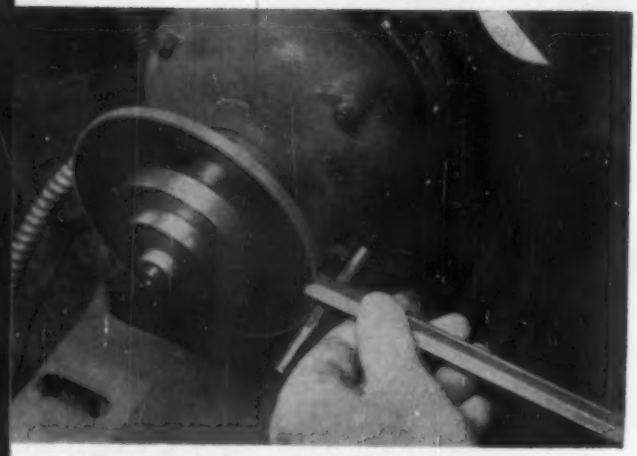


**Fig 6—Oil-clearance land . . .**
is sharpened on a peripheral wheel

**Fig 7—Inner nose angle . . .**
is sharpened on a face wheel. To assure accurate sharpening, guide must be aligned at proper angle

**Fig 8—Outer nose angle . . .**
is sharpened by adjusting movable guide-piece on fixture. Guide may be set for a variety of nose angles

correctly position the gundrill in the gage, hold the flat surface of the drill flush with the front of the gage. From the front, you have a sight gage for both angles and from the rear a gage for checking clearance and the inner angle. Remove burrs and mark the gage front and rear, to show the minimum tolerance for the oil-clearance shoulder.

When a gundrill has been used longer than it should have been, some damage along the outer edge of the flat will be apparent. Then the tip must be ground back to eliminate the damage.

Nose-grind styles are determined by the form of chip most easily removed for the coolant being used. Therefore, the suggested angles should be tried as follows: Nose styles 1 and 2 for free-cutting materials and hardness of Rc 22 and harder. Nose styles 3 for all other conditions. Some variations may be more convenient or, in some cases, necessary.

In sharpening, a primary angle of 10° is actually more than is needed but may be considered standard. Secondary clearance is required only on the outer angle, except for very large diameter gundrills of inserted-carbide. Roughing out the secondary clearance can be about 20°; usually it can be cut offhand.

The oil clearance is simply a square step which takes all the interfering parts of the nose back of the outer cutting corner. Remember, before putting the shoulder of a tool into the object being drilled, a hole must be made. Once the shoulder of the tool starts to enter the hole, the gundrill uses its own drilled hole as a bearing.

#### CAREFUL SHARPENING UPS TOOL LIFE

To finish the sharpening operation, run a slight chamfer from well below the outer cutting corner all the way around the bearing surface to the top of the shoulder. This chamfer prevents the tool from shearing the oilfilm which provides its support.

All of these clearances can be viewed through the rear of the sight gage. Unless gundrills are very large, no secondary clearance is needed for the inner angle. The primary clearance land should be very small, not more than 1/64 in. on small drills. It is there simply to show that the correct clearance has been ground on the drill.

Parts mentioned herein are the only parts of a gundrill or tube reamer which should be touched up. Touch up any other edge or surface and you ruin the tool. The only effect, for example, of different relationships of nose angles to each other will be to form a different shape of chip. The determining factor for resharpening is the width of the wearland. Amounts to be ground off depend on the damage to be removed at the outer corner of the outer angle. Gundrills can be sharpened until there is practically no carbide left or, with inserted-carbide tips, until the radius in back of the cutter meets the centerline of the tool. At 0.004 in. per sharpening, a 1-in. (usable) length of tool amounts to approximately 200 sharpenings, hence it pays to be careful. The greater the number of sharpenings, the shorter the tool life, and the greater the expense of diamond wheels.

# Tolerance Charts Aid Dimensioning for Machining

**Various plants are now using tolerance charts. In some instances, their use has reduced scrap and rework appreciably. There is a close relationship, too, between the tolerance chart and the $\bar{X}$-chart for statistical quality control**

WILLIAM K WOOD, project engineer, UTICA DROP FORGE & TOOL CO

Dimensioning for machine processing is based on the relationship of process dimensions to blueprint dimensions. Development and analysis of this relationship is determined by the use of a tolerance chart, which shows graphically the dimensions and location points to be held at every stage of manufacture. Control of the relationship is brought about by the use of an $\bar{X}$-Chart.

In theory, consideration of the purpose and application of a tolerance chart and an $\bar{X}$-chart indicates that their process relationship can be defined. Field information on a specific case history that relates these two charts seems not to be available or, if available, the data are not complete enough to show a definite relationship. But, the tolerance chart has proved its use in process engineering work, and the $\bar{X}$-chart has proved its use in statistical quality control. Similarity of the process data contained in the two charts is sufficiently significant to justify investigation of their co-ordinate use. Therefore, the theory is advanced here that dimensional analysis and control in machine processing is most effectively accomplished through a comparison analysis of a given tolerance chart and a given $\bar{X}$-chart.

### HOW THEIR PURPOSES COMPARE

The tabulation herewith compares the purposes of the two charts. Items (1) and (2) of the tolerance chart are directly related to items (1) and (2) of the $\bar{X}$-chart. That is, a given dimension and tolerance, as recorded on the $\bar{X}$-chart, should be the same as that given dimension and tolerance specified on the tolerance chart. When it is remembered that a tolerance chart specifies a dimension and tolerance before processing, and that an $\bar{X}$-chart records the dimension and tolerance that is produced, this fact becomes significant.

Items (3) and (4) of the $\bar{X}$-chart are related by statistical analysis to items (3), (4), and (5) of the tolerance chart. That is, the time of sampling, the average mean dimension, and the average range of measurement of the sample reflect the performance of the machine and tooling used at a given operation. Just what performance is obtained can be broken down, statistically, into such variables as tool drift, arbor-whip, table backlash, fixture eccentricity, off-form cutters, excessive tool pressure, and uneven loading rhythm. When this analysis is compared to the respective tooling data on the tolerance chart, a tooling summary can be developed showing:

(a) the tooling plan
(b) the tooling performance under processing conditions
(c) whether or not tooling modification or change is necessary
(d) what specific change is necessary

### STRUCTURE OF TOLERANCE CHART

Fig 1 is a tolerance chart for the machining process on a turned component. The dimensions above the heavy double line are the process dimensions. Below the double line, Col. 1 shows the model drawing dimensions and Col. 2 shows the resultant dimension which the process must produce. Above the double line, the open circles (o) indicate tool-locating surfaces on

**Comparative Purposes of Tolerance and $\bar{X}$-Charts**

| TOLERANCE CHART | $\bar{X}$-CHART |
|---|---|
| 1. Establish process nominal dimensions | 1. Plot the average mean (x) dimension of each sample |
| 2. Establish process tolerances | 2. Plot the range of measurement of each sample |
| 3. Establish the amount of material removed at each operation | 3. Record the time each sampling test was taken |
| 4. Establish tool-locating points for each operation | 4. Show a summary of each sampling test giving the average mean (x) dimension and the standard deviation ($\sigma$) |
| 5. Establish reference surfaces at each operation for each process dimension | 5. Show a composite summary of all sampling tests giving the composite average mean (X) dimension and the composite standard deviation* |
| 6. Compare a resultant finished dimension and tolerance to the model-drawing dimension and tolerance | |

* *Range of measurement*

Credits: Figs 1 and 2 through courtesy of Bendix Aviation Corp

## Tolerance Charts Aid Dimensioning for Machining . . .

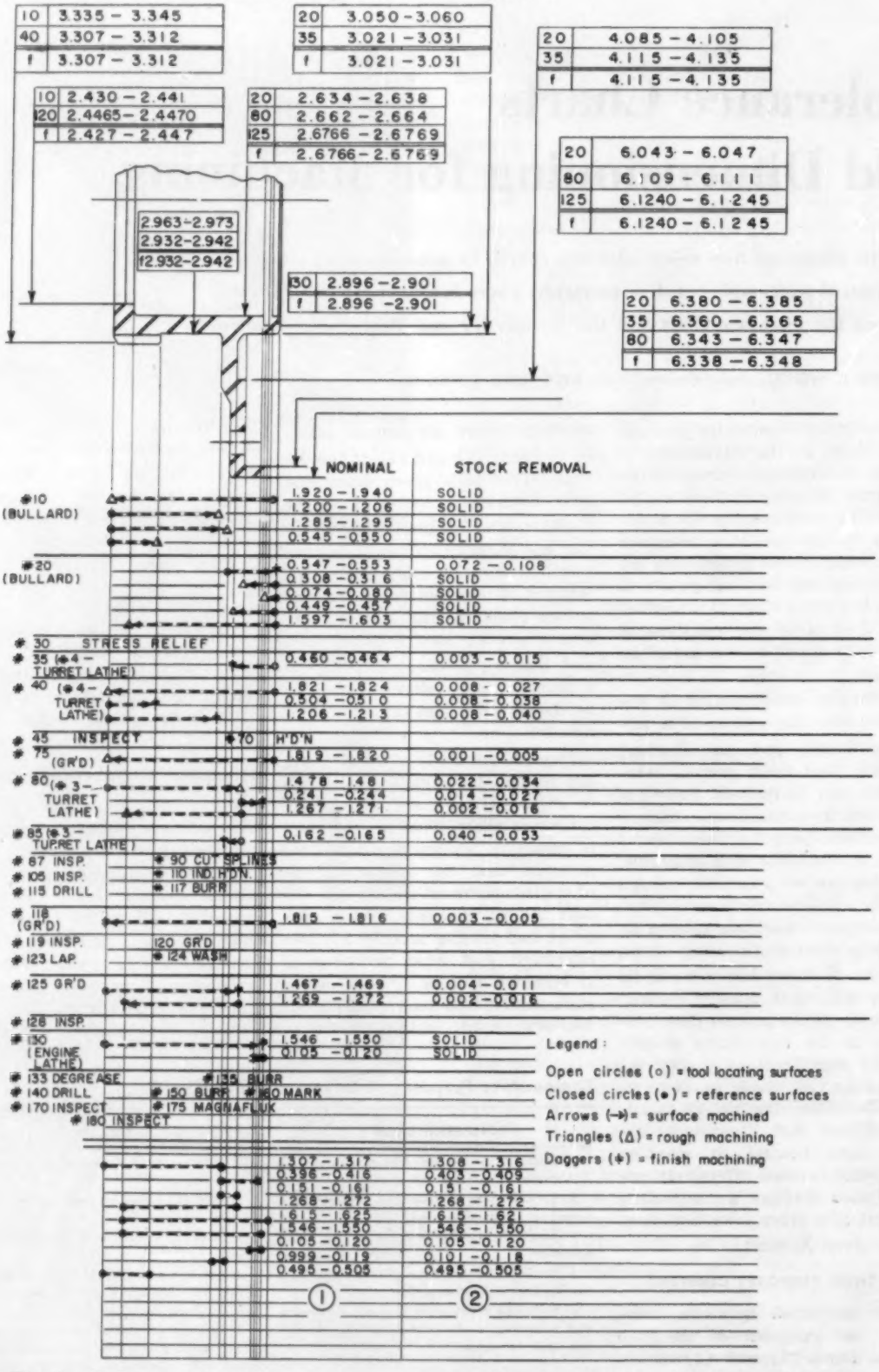



**Fig 1.. Tolerance chart** shows the process dimensions above the double line; Col 1 below the double line gives the model-drawing dimensions and Col 2 the resultant dimension which the process must produce

the product. The closed circles (.) indicate reference surfaces on the product which are related dimensionally to a locating surface. The arrows (→) indicate the product surfaces that are machined and show from which surface each dimension is referred. The triangles (△) indicate rough machining and the double daggers (‡) indicate finish machining.

### HOW TO USE THE TOLERANCE CHART

By following the vertical lines in Fig 1 upward from the model drawing dimensions, it will be seen that a given machined surface on the product is not necessarily referred dimensionally to the same surface in the process as it is on the model drawing. Process dimensions are established from convenient locating surfaces on the product, or are governed by the design of the tooling. Therefore, a given product surface on the model drawing would not always be dimensioned exactly the same in the process. Rather, a given surface on the model drawing would be referred, in the process, to the tool-locating surface from which it was produced. This changing of dimensional relationship—from model drawing to tolerance chart—allows for a tooling analysis of the process. It indicates the required shape or style of jigs, fixtures, nests, and plates for each process operation. In effect, it represents the tooling summary required by the process.

By using the basic theory of straight-line analysis, a given product surface, in the process, can be related to any other product surface by subdividing or adding to the dimensions from given locating points. This procedure, then, causes a tolerance accumulation in the position of the given surface. By proper consideration of such tolerance accumulation, a given dimension can be allowed to vary within reasonable process tolerances and still result in no more tolerance than is allowed on the model drawing.

Fig 2, a section of the chart in Fig 1, is a problem in determining the resultant relationship of the process dimensions to the 1.307-1.317 model drawing dimension. Considering the dimensional conditions for locating surfaces (o) and rough (△) or finished (‡) surfaces, the problem is resolved as follows:

$$(1.819\text{-}1.820) - (1.478\text{-}1.481) = 0.338\text{-}0.342$$

$$(0.338\text{-}0.342) + (0.162\text{-}0.165) = 0.500\text{-}0.507$$

$$(1.815\text{-}1.816) - (0.500\text{-}0.507) = 1.308\text{-}1.316$$

The process does not produce the exact model-drawing tolerance, because the accumulation of tolerances for the dimensions in the problem also affects the 0.151-0.161 dimension. Therefore, each dimension in the problem also has to be established in relation to the 0.151-0.161 dimension. This defines a tolerance chart as being the dimensional plan for a machining process.

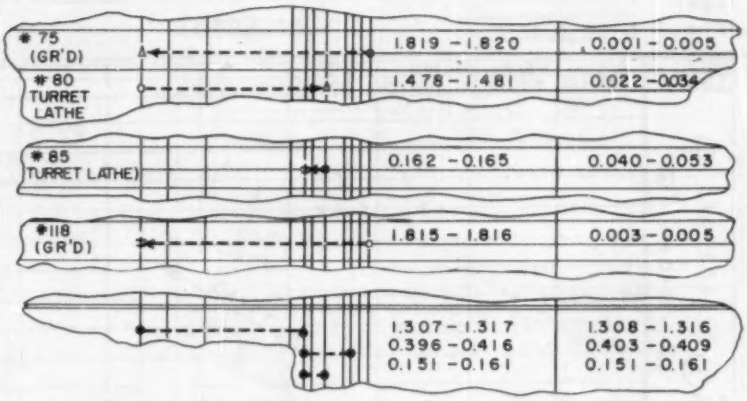



**Fig 2.. Process does not produce** exact drawing-model tolerance because of an accumulation of tolerances

### $\bar{X}$-CHART STRUCTURE

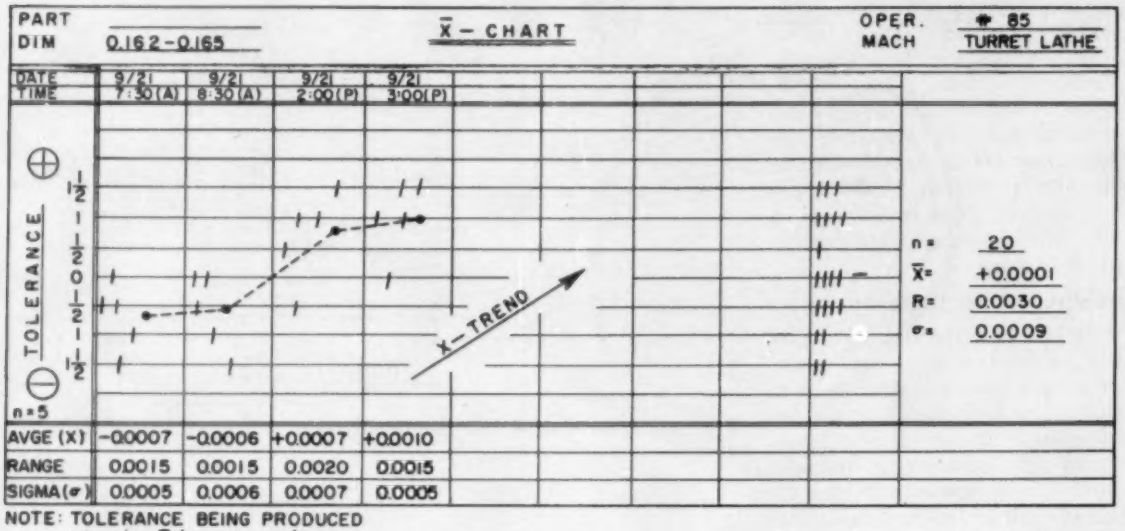
Fig 3 is a hypothetical $\bar{X}$-Chart for the 0.162-0.165 dimension at Operation No 85 in Fig 1. Construction of this chart is based on the Cartesian co-ordinate system. The positive $x$-co-ordinate becomes the mean of the given dimensional and the $y$-axis is used for the plus and minus sides of the tolerance. Each line on the $y$-axis represents an interval of length from the origin in terms of the given tolerance. Each individual measurement taken is recorded on the proper line according to its position in the tolerance. Each dot (.) is average mean of a group of individual measurements. A statistical summary of the analysis is shown at the bottom of each test where $n$=sample size, $x$=average mean dimension of each sample, and $R$=average tolerance range of each sample. The composite summary at the right of the chart is symbolized also by $n$, $R$, and $\sigma$. However, the average mean of all the samples is expressed as $\bar{X}$.

The average mean of each sample and the average range of each sample are characteristics of a distribution curve. This curve is parabolic across the $x$-axis of the chart. As the product measurements are recorded on the chart, the frequency at which a measurement occurs at +0.001, or −0.0015, or some other tolerance position establishes the curve. But the frequency of occurrence of each measurement is the tolerance being used by the given machining operation. Thus the ($x$) of each sample and the ($\sigma$) of each sample are significant to the performance of the given machining operation.

There is an ideal curve of distribution to which all curves are statistically compared. By a statistical comparison of a given curve to the ideal curve, it is possible to identify and measure excessive variation as well as normal variation.

### $\bar{X}$-CHART APPLICATION

Based on a statistical comparison of the characteristic curve of the chart in Fig 3 to the ideal curve, the first test shows that the machine was set to produce to 0.1628




NOTE: TOLERANCE BEING PRODUCED EQUALS $\bar{X} \pm 3\sigma$, OR, $X \pm 3\sigma$

**Fig 3 . . An X̄-chart** shows that the machine was set up to be within specified tolerance but that the limits were being exceeded. Therefore, the machine can hold only a much coarser tolerance than desired

and was using a tolerance of ±0.0015. An analysis of the second test shows that the machine was set to produce to 0.1629 and was using a tolerance of ±0.0018. And each test thereafter shows the set-up of the machine to be within the specified tolerance, but that the specified tolerance limits were being exceeded.

The fact that no individual measurements were observed to be outside the specified tolerance limits means only that the frequency of occurrence of outside-tolerance measurements is less than that of those measurements observed. However, that is not to say that outside-tolerance measurements would not occur at all—the fact of their occurrence is a statistical probability in terms of the observed measurements. Thus, it is possible to evaluate the dimensional performance of a given machining operation, over a period of time, on the basis of sampling only a few of the workpieces being produced.

Results of analysis of the chart in Fig 3 are:

1. $\bar{X} = +0.0001$ Machine was properly set throughout test period
2. $\sigma = 0.0009$ Exceeds specified tolerance limits of ± 0.0015
3. R = 0.0030 Within specified tolerance when observed
4. Trend of $x$ is low to high Dulling of cutter edge

Conclusion: The consistency of $R$ and the deviation of $\sigma$ indicate that ± 0.0027 is the tolerance that this operation can maintain under normal operating conditions.

When this information is coordinated with that of the tolerance chart, the following facts are evident:

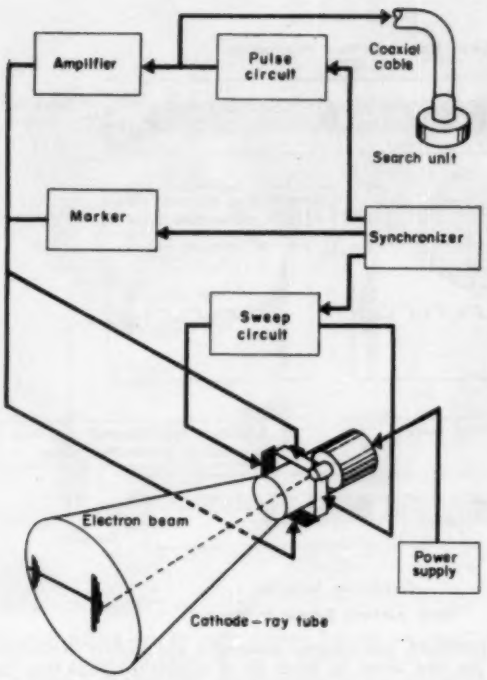
1. The specified process tolerance of 0.162-0.165 can be no more than ±0.0015 (changing this tolerance would change the tolerance of the 0.151-0.161 dimension and the 0.338-0.342 dimension)
2. The 0.162-0.165 dimension is produced by a turret lathe
3. The product is located on a machined surface
4. The 0.162-0.165 surface is generated by a single-point tool
5. The tolerance of ±0.0015 appeared adequate before machining took place
6. The tolerance of ±0.0015 was produced on the product as ±0.0027

With this data, objective action can be taken on the problem.

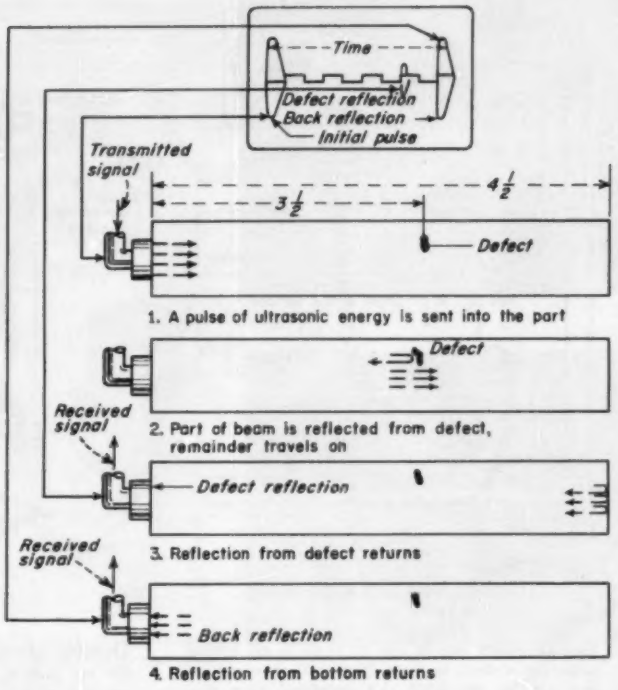
### DEFINITION OF PROCESS RELATIONSHIP

A comparison of the purposes of a tolerance chart and of an X̄-chart supports the theory that the two charts are closely related. Comparison of the application of the two charts shows that the tolerance chart provides a means of establishing and analyzing the process dimensions of the product, and that the X̄-chart provides a means of controlling to the process dimensions as they are produced on the product. Therefore, by coordinating a given X̄-chart with a given tolerance chart, one can define their process relationship as that of product dimensional analysis and control.

Tolerance charts are now being used by a number of companies. In one case, process engineers are responsible for a given number of machines, and use such charts on certain parts. When a new product was developed recently, the use of such charts reduced scrap losses from 20% to 5%. As the result the company was able to make early deliveries, exploit the market and make better profits.




**Ultrasonic inspection setup** includes search head, electronic circuits, and cathode-ray display tube. Permanent record of pattern can be made by photographing tube




**Single crystal in search unit** can act as both transmitter and receiver. Defect will reflect part of beam ahead of back edge of part, so flaw indication is between original pulse and back reflection

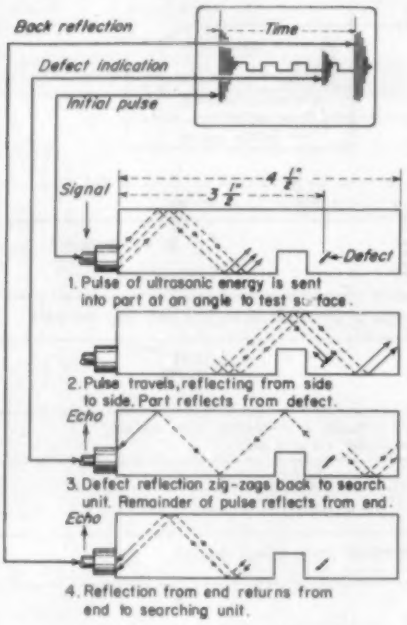
# Ultrasonic Inspection Makes Turbine Forgings Safer

**This relatively new method of inspecting for hidden flaws is a good bit more than an experimental novelty nowadays. With it you can check for flakes, pores, bursts, slag inclusions, and also see if heat-treating has been handled properly. Today, such critical parts as turbine shafts for steam-generator equipment can be inspected fully in a short time with no damage to the work whatever. Techniques are even now being developed to inspect parts for hidden flaws that may develop during service life or after minor accidents. Here is how it works and what it does**

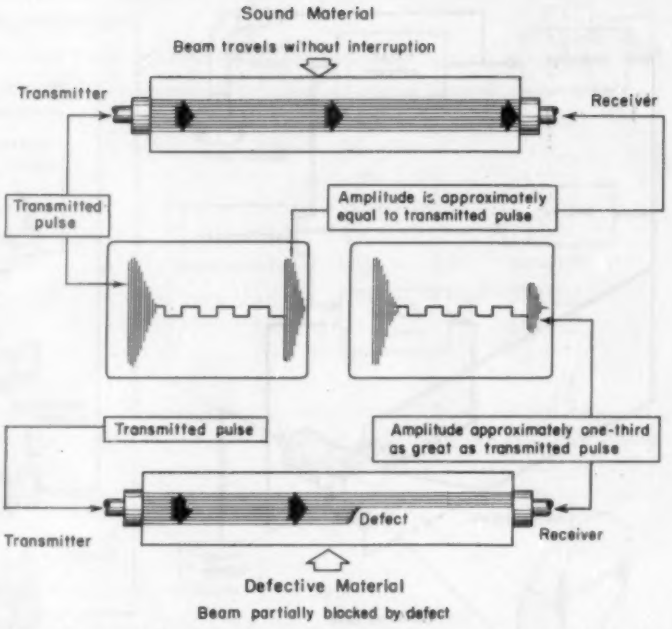
ROBERT N HAFEMEISTER, non-destructive test section,
ALLIS-CHALMERS MFG CO, MILWAUKEE

High-frequency sound for ultrasonic inspection is usually between 0.2 and 25.0 megacycles/sec (mc). The source of the energy is a piezoelectric quartz crystal vibrated at its resonant frequency—for which the crystal must be cut or selected—by electrical impulses. The crystal is assembled in a search head that is held against the work. Energy is transferred from the crystal to the work through a liquid coupling.

The search head can act as both a transmitting and receiving unit, or two crystals may be used: one for transmitting, one for receiving. In either case, the internal shape and condition of a metal workpiece under inspection will affect the original transmitted signal, producing a pattern on the face of a cathode-ray tube that can be in-


Back reflection
Time
Defect indication
Initial pulse
Signal
4 f/2
3 f/2
Defect
1. Pulse of ultrasonic energy is sent into part at an angle to test surface.
2. Pulse travels, reflecting from side to side. Part reflects from defect.
Echo
3. Defect reflection zig-zags back to search unit. Remainder of pulse reflects from end.
Echo
4. Reflection from end returns from end to searching unit.

**Shear wave** can be sent at angle to get behind undercut or neck in work. Neck will show pattern that can be identified and separated from flaw indication




**Double-crystal method** uses separate transmitter and receiver. Reflections are not picked up, but flaw shows up when all of transmitted pulse does not get through to pickup

terpreted to detect internal flaws in the work. Ultrasonic inspection has reached the point today where it can be applied to show defects in such parts as steam-turbine shafts, forgings, piping, castings, and weldments, most of which are covered by quality specifications within the range of ultrasonic inspection.

In addition to finding deep-hidden flaws, ultrasonic equipment will show up surface marks or hidden cracks covered by component parts at the surface of the work. An ultrasonic wave can be transmitted parallel to the surface of the work, as close as 0.05 to 0.100 in. from the surface. Curved surfaces can be inspected with search units that are themselves ground to fit the curve of the work. Angled ultrasonic beams can be sent out at angles from 45° to 85° from the surface, in 5° increments; and some search units are adjustable to any angle from 90° to 45°.

#### INSPECTING INGOTS

Steel ingots from which turbine forgings will be produced can be inspected ultrasonically to make sure forging effort will not be wasted. Such conditions in the casting as primary and secondary pipe, excessive porosity, or other gross defects are searched out. Locally ground spots regularly spaced on a longitudinal band can be used for inspecting the ingot. At 0.5 mc the defects can be plotted and recorded. Test results place the ingot in one of six classifications, ranging from 1A (soundest) to 3B (poorest). The forge shop determines the fitness for forging of each ingot from these records, taking into consideration the forging reduction necessary to produce the part required.

When a spindle shaft has been forged, it is subjected to one of the most comprehensive quality-control inspections possible. A minimum of four to five ultrasonic tests are applied, and a total of eight to ten tests may be made before final machining.

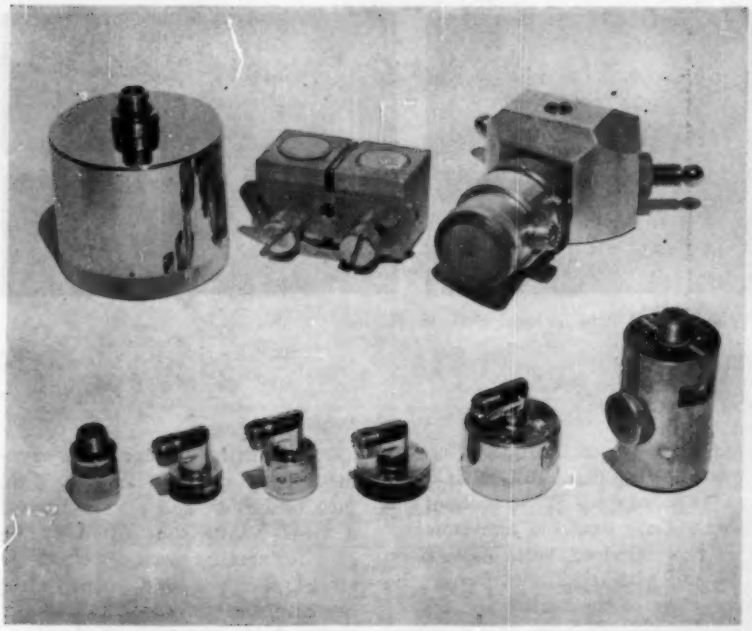
The first test detects only defects that may have developed during the forging operation. From four to six circular spots are milled on each end of the shaft and at several additional locations on various diameters where experience has shown that defects may develop. All areas are then tested at 1.0 mc and photos are made of the sonic patterns. If questionable areas are revealed, they are inspected further by additional sonic tests or by making short preliminary bores. If there is a bad center condition, the necessary bore size to eliminate the defect is determined.

#### NEW LATHE METHOD

Three identical ultrasonic tests, made at three different stages in shaft production, are the basis of acceptance or rejection of the forging. The technique was adopted primarily to detect hydrogen flakes and to differentiate between dirt inclusions and flakes.

The test uses the "double-crystal" method, with two search units, one to transmit the signal and the other to receive.

This method was originated in the steam-turbine industry.* The ASTM sub-committee VI on Brittle Failure of Steel Forgings was instrumental in providing open discussions of this method of ultrasonic inspection which led to its wide-spread use in electrical forgings. The shaft is bored and is given a "phonograph" finish for test-



**Search units** can be many shapes, but all are connected by coaxial cable. Hinged unit (top center) is adjustable to fit curved work of any diameter; double head transmits and receives. Large unit (upper right) is for inspecting bores

ing purposes. This finish is the result of controlled feeds and speeds with a lathe tool ground to a particular radius. This finish is used instead of the old, standard 125-mu-in. finish. It is easier to produce and is also cheaper.

The shaft is rotated in a lathe at a speed usually not over 6 surface ft/sec, and the search unit is travelled longitudinally at ¾ ipr. Ultrasonic frequency is 1.0 mc, and the ultrasonic heads are the 1-in. square or round type. This frequency produces a sound beam that diverges approximately 30°. Back reflection is adjusted to 3 in. on each diameter tested, and all indications as great as 5% or more of the back reflection are plotted and made part of the information file on the shaft.

Two distinct types of sonic indications may be noted. "Stationary" indications are usually associated with inclusions, bursts, or other gross defects. "Travelling" indications usually mean mid-radius defects of the flake category.

The test is applied after rough machining, prior to heat-treatment for physical properties, and after a heat-stability test.

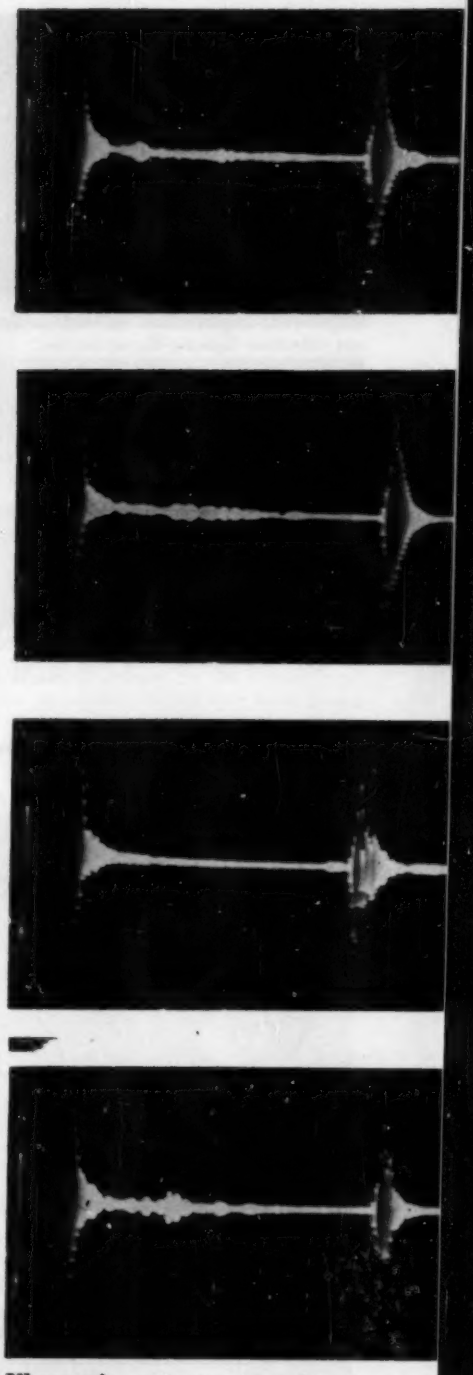
#### FUTURE TECHNIQUES

Experiments are now being made to develop a technique for inspecting a shaft with a crystal inside the bore. This would allow inspection after the shaft had been bladed, balanced, and then oversped, just before shipping. Another idea is to make a complete record of each such bore inspection on movie film. Similar tests could be made at later dates, or after a given number of service hours, and any change in pattern could be easily detected.

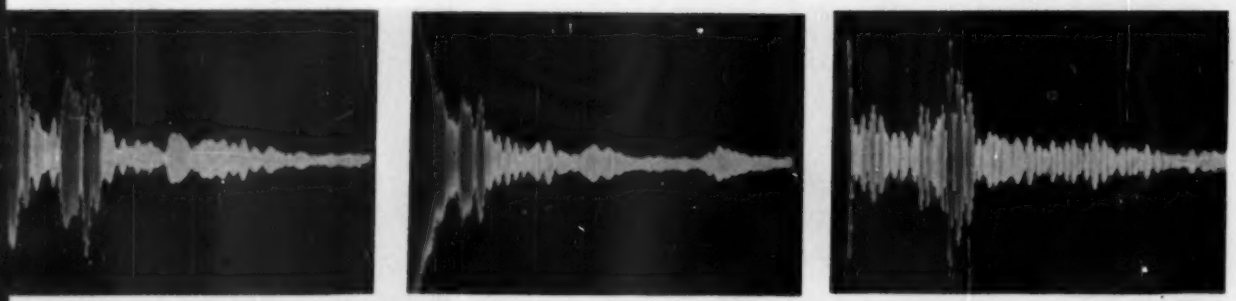
Proof that ultrasonic inspection can be accurate is provided by a case history where a defect was discovered near the position of a turbine blade that required a milled slot. It was decided that the defect could be removed if the shaft was trepanned at 15° from normal. This was done, and the trepanning bar carried out the two large silicon inclusions. Inspection showed that the defects were completely enclosed in the ¾-in.-radius trepanned section.

#### TESTING OTHER PARTS

"Double crystal" setups, as well as single-crystal techniques, are



**Ultrasonic patterns** of sound workpiece show only minor distortions—nothing that indicates structural weakness. This ingot was rated at class 1A



**Imperfect ingot** shows different pattern, which caused it to be rated class 3B. Intermittent reflections indicate discontinuities

applied to spindle rings, coupling gears and flanges, and generator rotor shafts, as well as the spindle shafts. Single-crystal techniques are applied to manifolds, Y-connections, stop-valve bodies, and stud bolts.

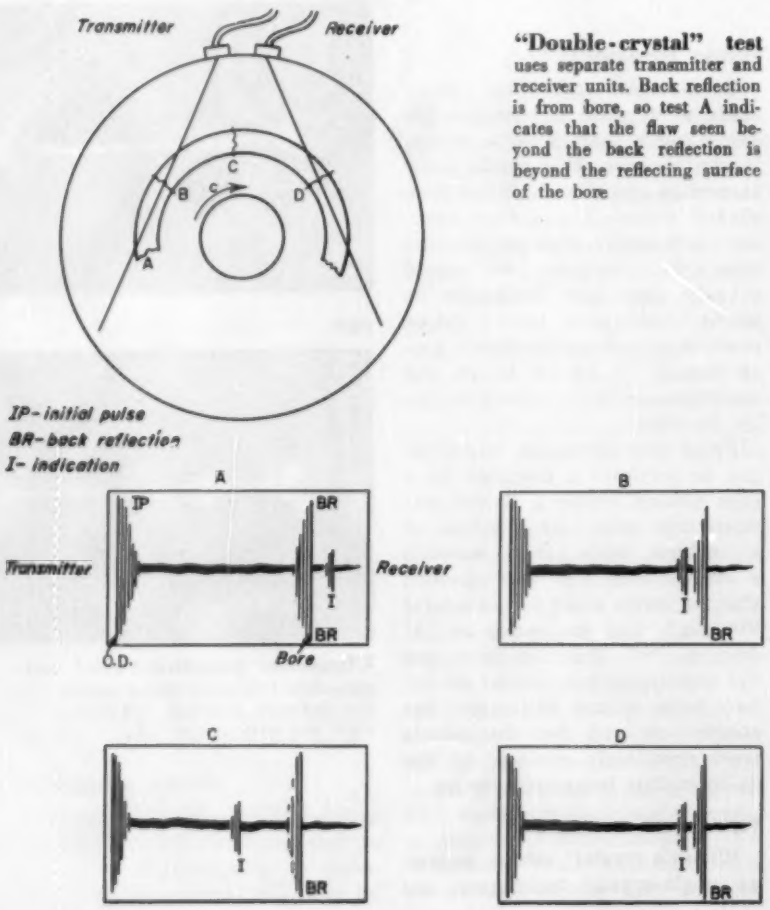
Stud bolts are tested at 10.0 mc, with the crystal applied only to the exposed face of the bolt after removal of the cap nut. Cracks 0.050 in. or more deep at the roots of the threads are detected and isolated. Several hundred bolts have been tested, with results proving the accuracy of the test.

High-temperature steam pipes are also tested by ultrasonics, when specified, using a shear-wave crystal placed directly against 6-in. pipe or larger, and placed against a clear plastic shoe fitted to the pipe for smaller sizes. Pipe is tested at the vendor's plant, after bending and forming, and finally in the field after being welded.

Other parts tested ultrasonically include the rotor-coil support rings, which are checked three times. Plates for stator yokes are checked for laminations and segregation. Commutator bars are checked to guard against cracked or broken bars.

After X-ray inspection has detected faults in castings, the work can be inspected ultrasonically to determine the depth of the defects so they can be removed with the least amount of gouging and repair.

Experimental work in ultrasonic inspection is being aimed to increase the accuracy with which defects can be identified—as to size, shape, and character. Stellite inserts brazed into turbine blades are being inspected experimentally, and the internal condition of pump, motor, pipe, and bolt materials is being investigated. Ultrasonic inspection has become one of the standard inspection methods for producing the soundest possible turbine parts and for their continued inspection all during service life.

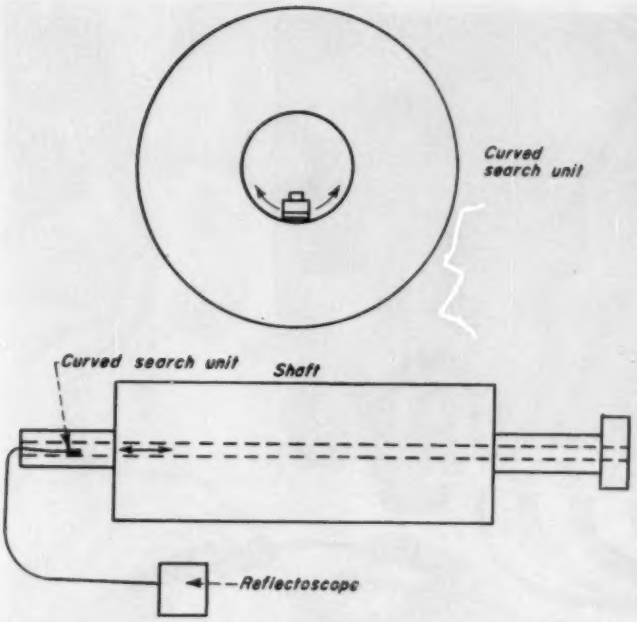



**"Double-crystal" test** uses separate transmitter and receiver units. Back reflection is from bore, so test A indicates that the flaw seen beyond the back reflection is beyond the reflecting surface of the bore

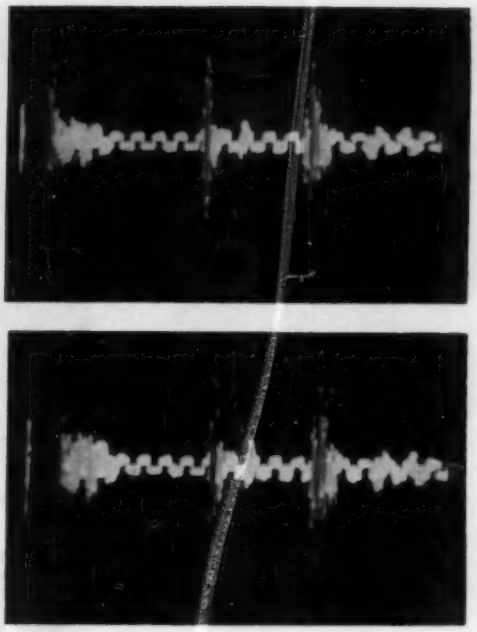
**Bibliography**

• "Acceptance Guide for Ultrasonic Inspection of Large Rotor Forgings," A W Rankin and C W Moriarty, ASME Transactions, Vol 78, No. 7, p 1603-1622, Oct '56

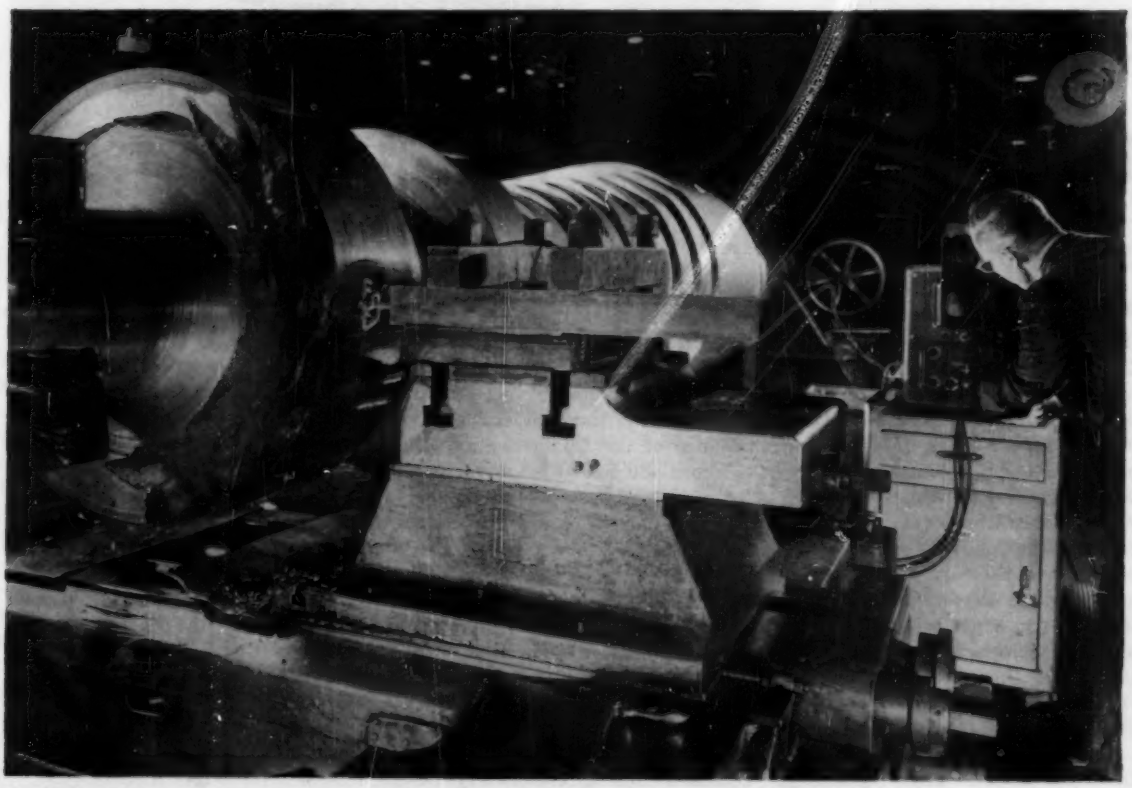
ULTRASONICS—Benson Carlin, McGraw-Hill Book Co, 1st ed, '49.



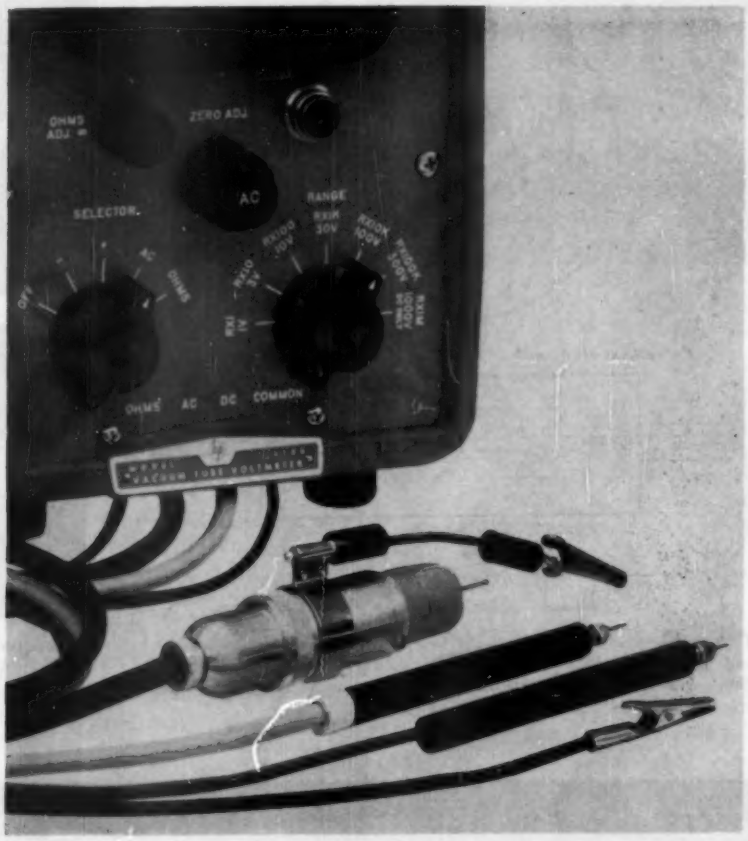

**Curved search unit** fits shaft bore. Unit is pushed through bore, and will indicate any flaw in shaft by showing momentary reflection as flaw passes under search unit. Either shaft or search unit may be rotated to new positions



**Stepped shaft** is indicated by the various "pips" in this photo. Actual distances on shaft agree proportionately with relative spacing of indication on tube face



**Shaft-checking setup** is made with search unit pressed against rotating work, held on cross-slide. A discontinuity will show up on the tube screen as work rotates




**Meter probe can be soldered** to electronic circuits under test without melting plastic tip; irradiated polyethylene is nearly unbreakable as well as heat-resistant

# Thermoplastics are Thermosetting . . .

**Bombardment of polyethylene with high-speed electrons increases its heat resistance to about 480 F. Here's how two**

Problems with polystyrene led Hewlett-Packard Co, Palo Alto, Calif, to investigate other plastics for the probe tips used in their line of h-f vacuum-tube voltmeters. Different rates of expansion of the electronic components imbedded in the plastic tips caused low-temperature stress cracking, resulting in exposure of the internal parts to moisture. Conventional polyethylene eliminated this problem but could not be used at high ambient temperatures or where the probe tips were soldered directly into electronic circuits under test.

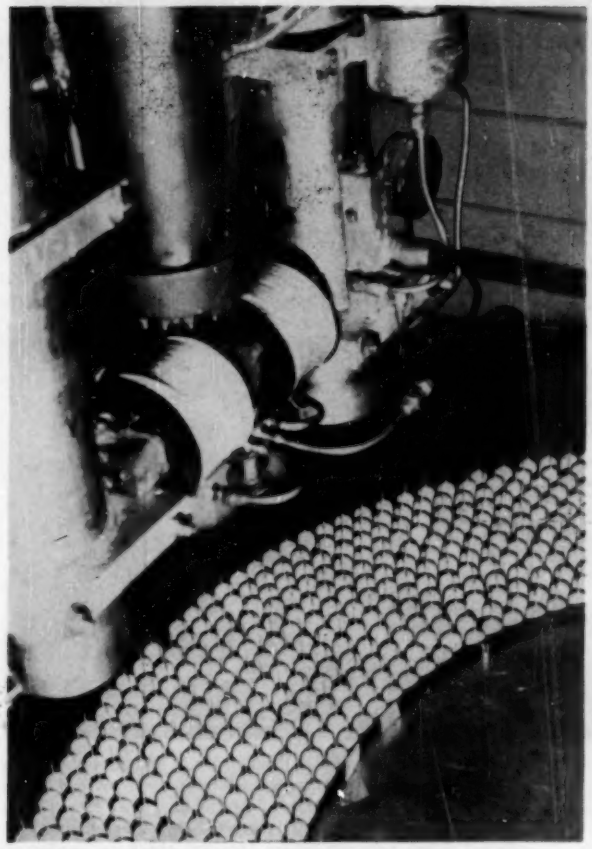
The way out of these difficulties was found when engineers from Hewlett-Packard and Applied Radiation Corp, Walnut Creek, Calif, bombarded sample polyethylene probe tips with high-speed electrons from Arco's 8-million volt linear accelerator. Tests showed the temperature resistance of the tips was increased to about 480 F with no adverse effect on the resistance of the material to low-temperature cracking.

**Radiation as a tool . . .**

. . . causes chemical changes by creating free radicals. Most chemical transformations are brought about by manipulating temperature, pressure, or catalytic systems. High-energy radiation thus becomes a fourth, completely new, processing tool because it can create free radicals irrespective of temperatures and pressure. Moreover, it requires no catalysts (which usually contaminate materials), and it can act in solids.

The creation of free radicals in solid materials makes high-energy electrons especially valuable for treating plastics. Products such as the probe tip are made by conventional means without need for special equipment or processing. Finished parts are merely passed through a beam of high-energy electrons that cause the polymer chains to cross-link (in the case of polyethylene), thus transforming the thermoplastic material to a thermoset. Result: The polyethylene will no longer melt.

When high-energy electrons are stopped in a heavy metal target



**Test at 404 F for 30 min** leaves irradiated polyethylene probe tip sound, untreated tip melted. Electrons make polymer chains cross-link to transform the thermoplastic into a thermosetting resin

**Plastic probe tips on rotating table** are bombarded by high-speed electrons from 8-Mev linear accelerator. Beam is magnetically scanned so it covers full width of table load. Unit is surrounded by 4-ft concrete walls for protection, but it may be approached immediately after shutoff with safety. No residual radioactivity remains in irradiated parts

# After Irradiation

GEORGE H. DeGROAT, Detroit editor

**West Coast firms, Hewlett-Packard and Applied Radiation Corp, apply this process to improve voltmeter probe tips.**

such as tungsten, penetrating X-rays are generated and create the same effects as electrons. X-rays in this application are essentially equivalent to the gamma rays from radioactive isotopes. The research unit at Walnut Creek can treat materials over 2 ft thick with X-rays, and large industrial units can accommodate even heavier sections.

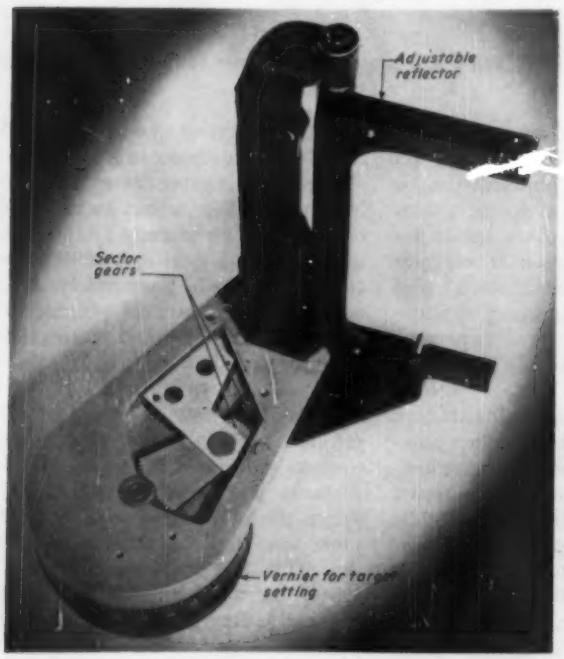
**Properties of irradiated polyethylene . . .**

. . . make it suitable for continuous use at 250 to 275 F; and for short exposures, such as dipping in hot solder, it is heat-resistant to about 480 F. Although the plastic will not melt, it is attacked by oxygen at high temperatures unless it is coated or used in an atmosphere free of oxygen. With protection from oxygen, the material can be used continuously at temperatures higher than these. As a result, irradiated polyethylene is superior to the unirradiated material and can be employed in many applications where the more expensive polytetrafluorethylene ("Teflon") is now required.

In addition to improving its heat resistance, irradiation makes polyethylene more resistant to corrosive liquids and high-temperature creep, and it almost completely eliminates environmental stress cracking. Consequently, it makes a superior pipe and an ideal wire coating. Moreover, it is practically unbreakable. If irradiated polyethylene is deformed cold until set occurs, it will return to its original shape when heated from 250 to 300 F. Therefore, it can be shrunk on such things as coils and magnets to form a dust and moisture-resistance sheath. Fortunately, the advantageous electrical properties found in conventional untreated polyethylene are essentially unchanged.

Irradiated low-density polyethylene is also superior in most properties to the new (unirradiated) high-density polymers. When the new high-density polymers are irradiated, there are indications that they become even better, but too little work has been done with them to supply detailed data.

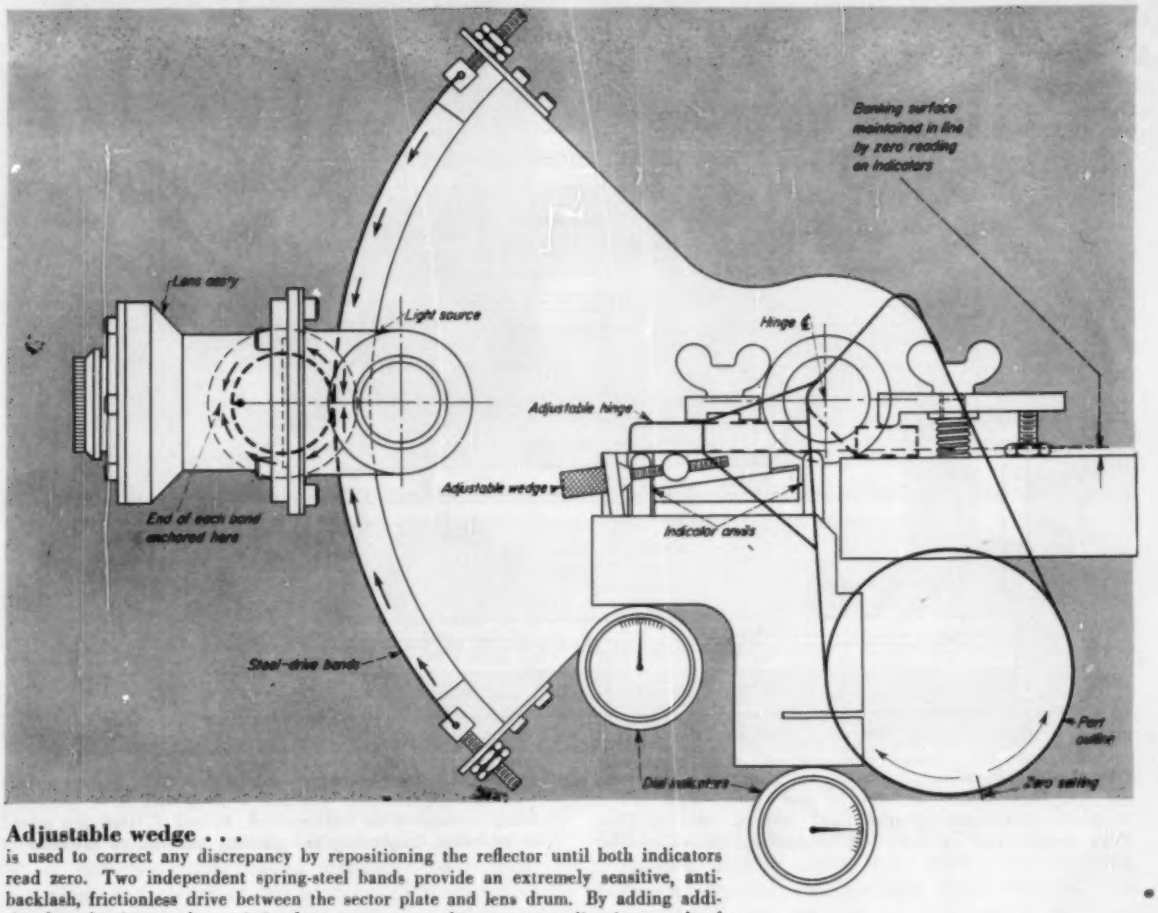
**Optical gaging fixture . . .**
checks the degree of alignment between the target-setting vernier and the adjustable reflector frame accurate to 1/5 of a gunnery mil (error 1 ft in 1 mile). As the vernier is rotated, a pair of sector gears transmit the motion to the adjustable reflector that pivots on a hinge. Motion from the reflector is transmitted at a ratio of 10:1 to the projection lens through a non-slip, anti-backlash steel-band drive. Light passes through a 0.0001-in. slot and is projected by the lens over a 40-in. radius onto the scale graduated in fifths of a mil. Errors from accumulated tolerances are corrected on the fixture for each individual reflector before accuracy check is conducted. Instrument is used for air-to-ground rocket firing and keeps the pilot on target when he is in a dive position




# Optical gaging

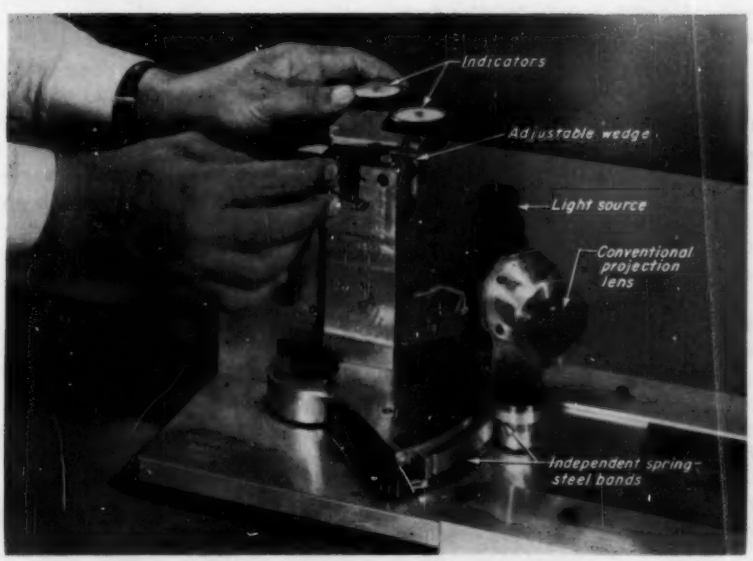
W W HENNINGER, project engineer,
DACO INSTRUMENT CO, BROOKLYN, NY

Compact optical instrument accurately measures angular displacement of an adjustable reflector used for air-to-ground rocket firing. Formerly, this same inspection operation required two men and an instrument over 20 ft long. The current instrument is 50 in. long, and requires but one man who can go through the entire inspection procedure 75% faster than formerly. It also has a higher degree of reliability to repeat readings consistently, because there is no slippage between the output of the adjustable reflector and the light source. If you are having a problem measuring angular displacement we are confident you will find this instrument a noteworthy contribution

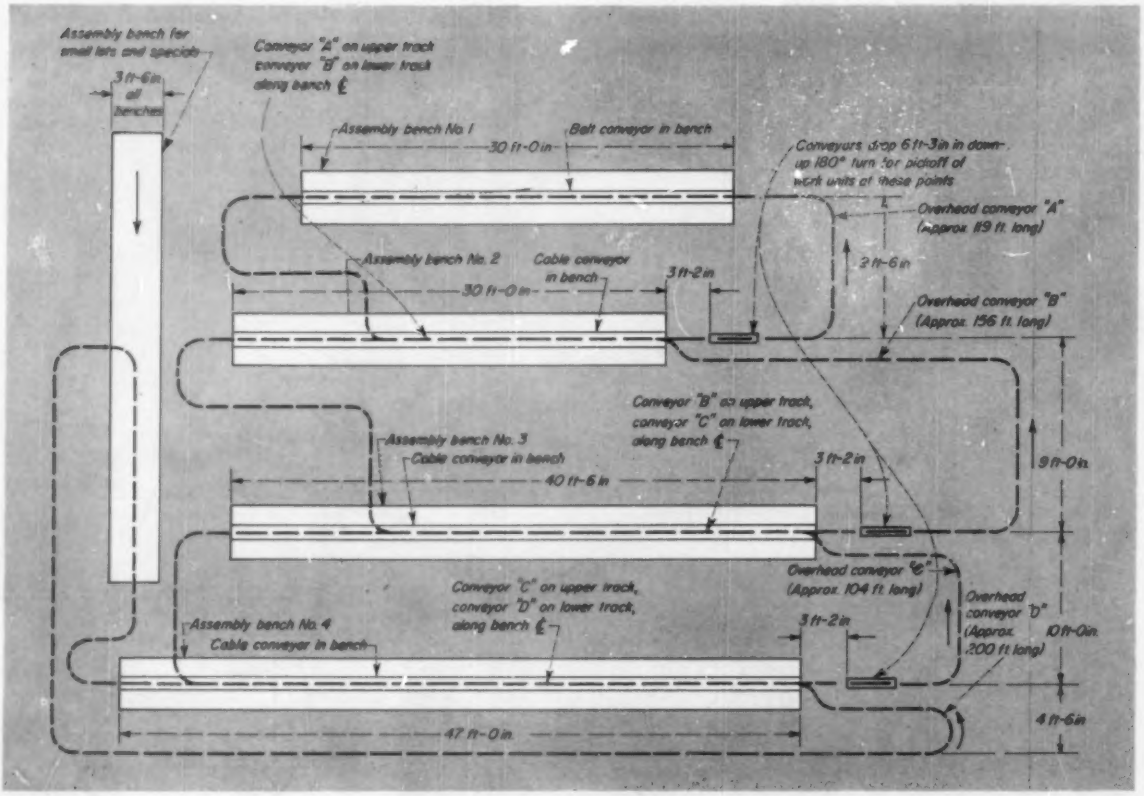



**Adjustable wedge . . .**
is used to correct any discrepancy by repositioning the reflector until both indicators read zero. Two independent spring-steel bands provide an extremely sensitive, anti-backlash, frictionless drive between the sector plate and lens drum. By adding additional graduations to the semi-circular screen, extremely accurate reading in seconds of arc can be achieved

# checks 1-ft error in 1 mile




**Indicators are zeroed in . . .**
with gage blocks to assure perfect alignment and parallelism between banking surfaces of reflector frame and hinge. When reflector is mounted in fixture, both indicators must read zero before actual testing commences


Assembly bench for small lots and specials
3 ft-6 in. at benches
Conveyor "A" on upper track conveyor "B" on lower track along bench ℄
Assembly bench No. 1
30 ft-0 in.
Belt conveyor in bench
Conveyors drop 6 ft-3 in. in down-up 180° turn for pickoff of work units at these points
Overhead conveyor "A" (Approx. 119 ft. long)
2 ft-6 in.
Assembly bench No. 2
Cable conveyor in bench
30 ft-0 in.
3 ft-2 in.
Overhead conveyor "B" (Approx. 156 ft. long)
Conveyor "B" on upper track, conveyor "C" on lower track, along bench ℄
Assembly bench No. 3
Cable conveyor in bench
40 ft-6 in.
3 ft-2 in.
9 ft-0 in.
Overhead conveyor "C" (Approx. 104 ft. long)
Conveyor "C" on upper track, conveyor "D" on lower track, along bench ℄
Overhead conveyor "D" (Approx. 200 ft. long)
3 ft-2 in.
10 ft-0 in.
Assembly bench No. 4
Cable conveyor in bench
47 ft-0 in.
4 ft-6 in.

**"Protectorelays"** . . . made by Minneapolis-Honeywell are assembled on line consisting of four benches with built-in conveyors, interconnected with four overhead conveyor lines. Fifth bench (left) is used for assembling special small-lot orders, and does not have built-in conveyor. Volume orders pass through assembly benches 1, 2, 3, and 4 in sequence, being transferred on conveyors *A*, *B*, and *C*, then are moved to soldering, inspection, and packing stations on conveyor *D*

# Overhead conveyors feed assembly benches

JAMES V JENSEN, supervisor of assembly methods, Downtown Plant,
MINNEAPOLIS-HONEYWELL REGULATOR CO

**Assembly of relays is speeded with this setup, in which overhead conveyors of novel design load cable conveyors built into assembly benches**

Assembly of "Protectorelays" for oil-burning residential and commercial heating plants was improved three years ago by a complete revision of the operations involved and by the installation of novel automatically loaded, conveyorized assembly benches. Flexibility of the new setup has been proved several times by revisions in assembly procedures that improved quality and cut costs.

Previous assembly line, which involved seven operations on a group of paced assembly benches—each consisting of a partitioned belt conveyor running the length of the bench—was complicated by an adjusting operation for which time required varied considerably. This arrangement had several serious deficiencies:

1. Inherent lack of balance (because of the variable adjusting operation) made it necessary to keep several utility operators on duty constantly, in order to maintain a balanced condition.
2. Variations in individual operator output affected the entire line.
3. Small number of operators assigned to each of the seven operations negated process improvements which could have reduced labor costs.
4. Unbalance within the line made it necessary to build idle time into standards, causing excessive labor costs.

The entire line was revised to incorporate four new conveyorized assembly benches and four separate overhead conveyors, all operating continuous-

**Wire cables . . .** on each side of slot along center of bench conveyor form a conveyor that moves relay units from pickoff unit to work stations along this assembly center. Because all operations along bench are identical, production is in direct ratio with number of operators. When an operator completes work on a unit, she places it on a hanger of overhead conveyor moving along center of bench

**Cables of bench conveyor . . .** move continuously in grooves cut into long maple blocks that have CRS wear strips along the bottom. Relay units are kept in line on cables by angle-iron guides

ly. Work elements were combined, and the number of assembly operations was reduced from seven to four, each assigned to a separate workbench.

Each of the first three overhead conveyor loops is designed to remove the product from one operation and deliver it directly to the next operation, with a portion of the product being recirculated only when an overload condition exists at the workbench to which the conveyor makes its deliveries. These conveyors are loaded manually, each passing along the center of the workbench from which it makes pickups, but are unloaded automatically at the next workbench with a pickoff unit designed and built by Minneapolis-Honeywell.

The fourth overhead conveyor loop, like the first three, is loaded manually from the workbench over which it passes, and is not unloaded automatically.

Since the system was installed, late in 1954, a mechanized dip-soldering operation has replaced hand-soldering operations previously done at one of the assembly benches, and the line was rebalanced without difficulty. This new fifth (soldering) operation works from and to the fourth overhead conveyor, outside the assembly-bench area.

Besides picking up completed relays from the final assembly bench, the fourth overhead conveyor also picks up special relay assemblies, and special orders for small lots of standard units, from a "small-lots" assembly bench (see layout sketch).

Soldered relay assemblies are delivered by the fourth overhead conveyor to a final inspection and packaging group.

All the benches in the improved "Protectorelay" assembly line were specially designed, because of the unusual shape and weight distribution of the product, which has a long probe tube extending from the rear face of the assembly.

The first bench in the line has a canvas belt with slider bars that distributes the subassemblies to the operators spaced along each side of the bench. Units move along this conveyor with the tube up.

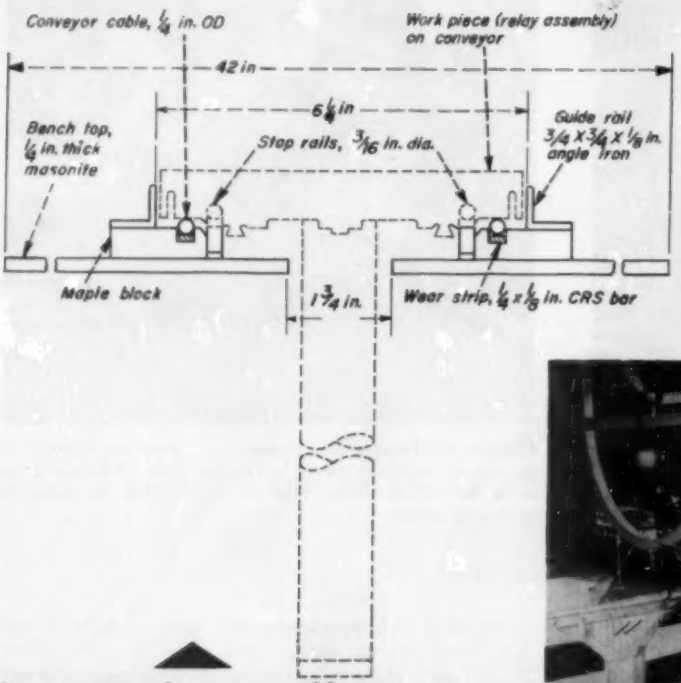
Benches 2, 3, and 4 in the line carry the units with the tube down, suspended through a longitudinal slot in the bench between two continuously moving ¼-in.-dia, 7 x 37 wire cables. Adjustable-speed drives at each bench move these cables at 10 to 30 fpm—usual setting is 15 fpm.

At each station along these three workbenches, between two opposed operator work stations, the approaching unit on the cable conveyor is lifted from contact with the cables by sliding up on 10-in.-long pairs of stop rails. Each pair of rails holds two relay units, until an operator at the station lifts one off for processing, or until an oncoming unit pushes the first unit on the stop rails off and back onto the moving conveyor cables. This sequence continues until both the stop rails and the intervening lengths of conveyor cables are filled with units. The pickoff unit for this bench then is automatically retracted, until the bench again is partially cleared.

The overhead conveyor loops are Richards-Wilcox "Zig-Zag" type, and have adjustable-speed drives that move the conveyor cables at 10 to 20 fpm. Standard conveyor units were used, except for hangers (which were made from ¼-in.-dia steel wire, spaced 2½ ft apart) and the vertical 180-deg curve sections at the automatic pickoff stations for benches 2, 3, and 4.

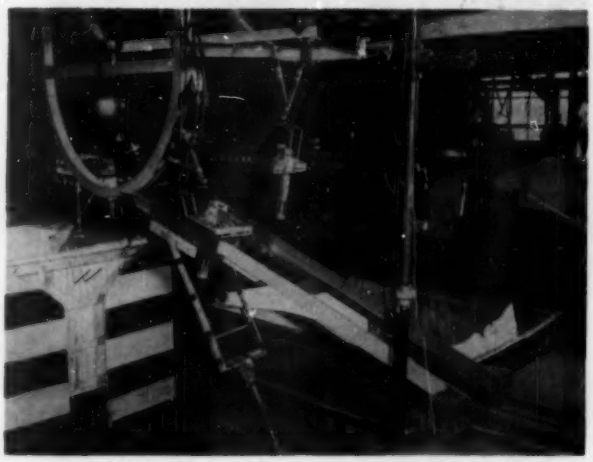
Where a conveyor passes along one of the benches for manual loading of units onto the hangers, the guiding and supporting track is placed 68 in. above the floor, allowing ample room above the 33-in.-high bench for clearance between the bottom of each hanger and units on the conveyor built into the bench. Elsewhere, track height is 125 in.

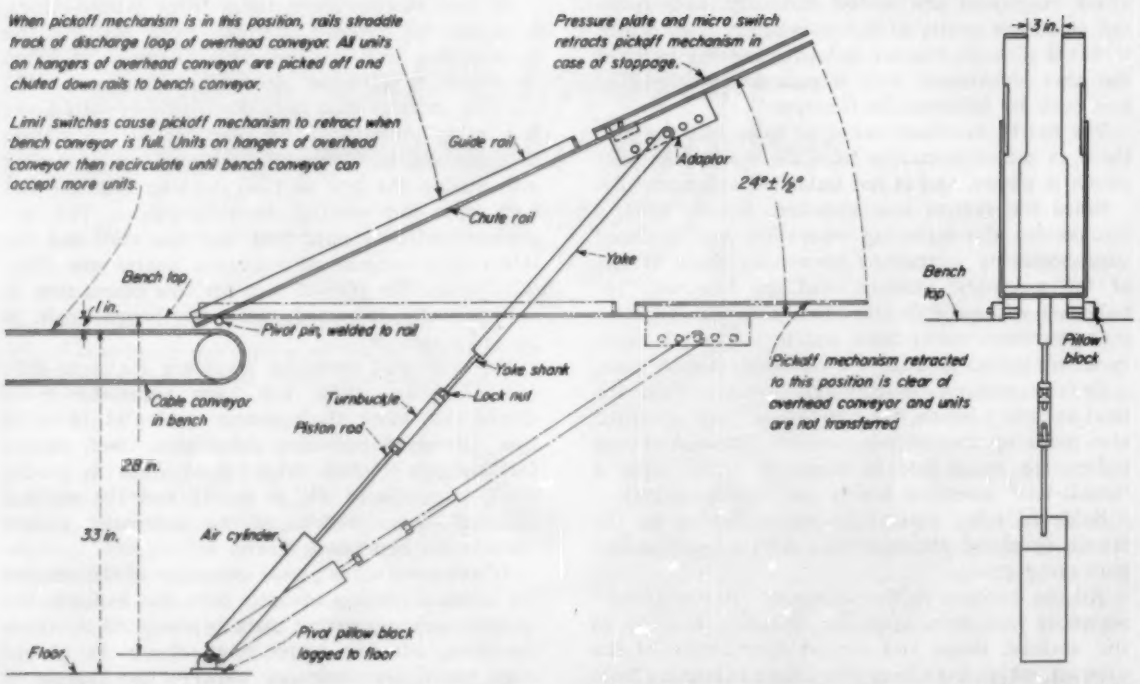
## Overhead conveyors . . .


Conveyor cable, ¼ in. OD
Work piece (relay assembly) on conveyor
42 in
6¼ in
Bench top, ¼ in. thick masonite
Stop rails, 3/16 in. dia.
Guide rail 3/4 x 3/4 x 1/8 in. angle iron
Maple block
1 3/4 in.
Wear strip, ¼ x ⅛ in. CRS bar

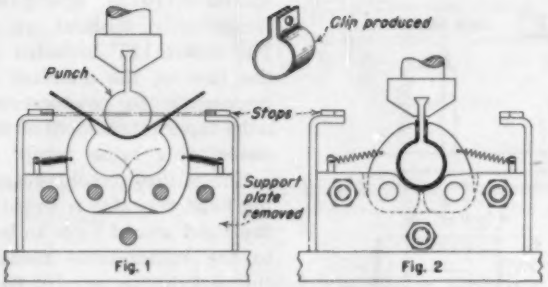
**Arrangement of conveyor cables . . .** guide rails, and stop rails for assembly benches insures centering of probe tube under relay unit in longitudinal slot in center of bench. Stop rails lift unit ¼ in. above moving cables

**Air-operated pickoff unit . . .** at end of assembly bench holds chute rails on each side of hangers moving downward on vertical loop of overhead "Zig-Zag" conveyor, so that relay units will slide off and move down to cable conveyor built into bench. Air cylinder drops rails when bench is filled, allowing units on overhead conveyor to recirculate




When pickoff mechanism is in this position, rails straddle track of discharge loop of overhead conveyor. All units on hangers of overhead conveyor are picked off and chuted down rails to bench conveyor.
Limit switches cause pickoff mechanism to retract when bench conveyor is full. Units on hangers of overhead conveyor then recirculate until bench conveyor can accept more units.
Pressure plate and micro switch retracts pickoff mechanism in case of stoppage.
Guide rail
Adaptor
24° ± ½°
Chute rail
Yoke
Bench top
1 in.
Pivot pin, welded to rail
Yoke shank
Turnbuckle
Lock nut
Piston rod
Cable conveyor in bench
28 in.
33 in.
Air cylinder
Floor
Pivot pillow block bolted to floor
Pickoff mechanism retracted to this position is clear of overhead conveyor and units are not transferred
3 in.
Bench top
Pillow block

**Pickoff mechanism . . .** designed and built by Minneapolis-Honeywell is controlled by five precision Micro switches and two relays. Angle to which rails are raised for pickoff is critical; it must be sufficient to insure that assemblies slide down to bench without jamming, but not so steep that they will be damaged when stopped




## Single Stroke Bends and Forms Clip

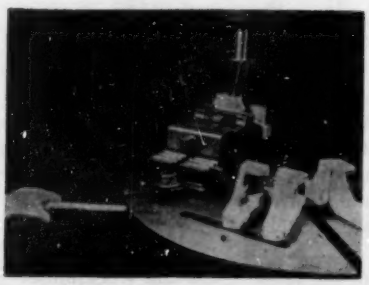
The illustrated die was made to produce simple sheet-metal clips economically. The clips, having two bends and a circular form, would ordinarily require two operations, but this die completed a clip with one stroke of the press.

The previously-cut-to-length and punched strip is nested in the die between locating stops. Fig. 1 shows the start of a bend. The punch continues its descent, U-bending the strip until the punch exerts pressure on the bottom inside face of the bending jaws. This closes them up, completing the forming and bending as shown in Fig. 2.

When the punch returns, the jaws open up, assisted by the springs, and the finished clip is slid off the punch. This can be done by hand, by a knockout pin, or by blowing it off with compressed air because the springback of the strip makes it hang loosely on the punch.

In Fig. 1 the side plates are removed from the die to show the simplicity of construction. The jaws do not depend on the pivot pins to resist the pressure of the punch. Instead, the jaws are fitted to the die block so they rest in the recess of the block. If it is felt that the punch stem is too weak, an end plate can be added to it for support.

*Hjalmar Dahl, Upplands Vasby, Sweden*



### Emergency Milling Operation Performed in Drillpress

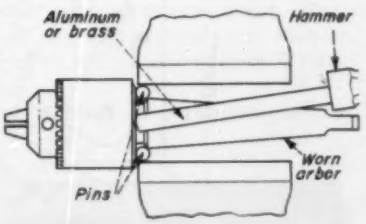
All our milling machines were in use with high-priority jobs, leaving us temporarily stumped for a machine to do some simple face milling. The job was to face off one side of a batch of aluminum castings, prior to other machining operations.

The photo shows the manner in which the job was done in the drillpress. A large, heavy-duty drillpress with its spindle bearing in good condition and with a circular work table was selected. A tapered-shank end mill was mounted in the spindle, and the work was held in a machine vise bolted to the table.

The table locking screw was loosened just enough to permit the table to be rotated by a lever inserted in one of the table T-slots. After the cutter had been set to the proper depth, the table was hand-rotated to swing the work under the cutter. The table was then swung back to the starting position to load the next piece in the vise.

For additional facing coverage, should the end mill be too small to finish the face in one pass, the column clamp is loosened and the table adjusted to allow another cut, after which the clamp is retightened. But beware of climb milling. Out milling is a must, or the cutter will rip into the work, causing damage, and you'll lose control of the feed.

*H J Gerber, Stillwater, Oklahoma*




### Chuck Arbor Removed With the Help of Pins

Gear chucks equipped with a tapered shank and used in drillpresses or lathe tailstocks will eventually lose their accuracy through wear of the arbor. It is therefore necessary to replace such an arbor to regain the concentricity of the chuck and to preserve the spindles in which it is used.

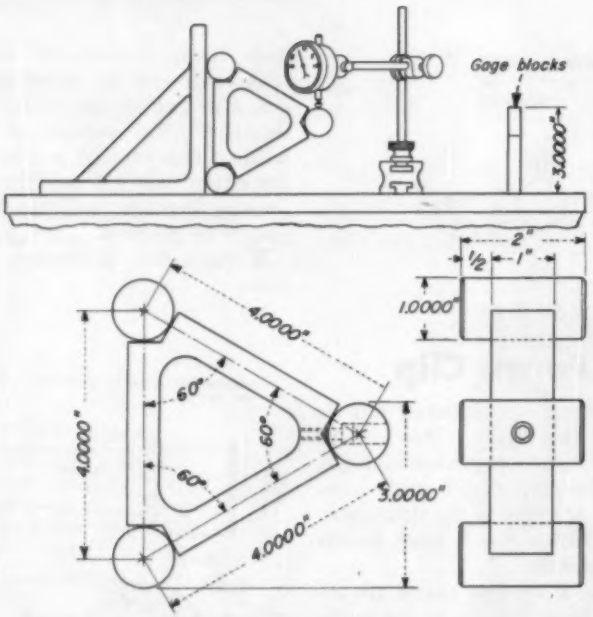
To remove an arbor without causing damage to the chuck is usually not an easy job. But the illustration shows one method that we have used with success. I have not found many arbors that were smaller in diameter than the taper seated in the chuck, but these would be this method's only limitation.

The chuck arbor is gripped between a pair of pins in a vise. These pins should be of either mild steel or brass and of a diameter large enough so they will not bottom in the undercut.

If help is needed after pressure is applied, a brass or aluminum rod struck with a hammer and directed to the back of the chuck near the arbor will usually jar it loose. Just make sure the chuck will fall in a soft spot or arrange to have somebody catch it.

*R B Courtney, Whittier, Calif*

# Practical Ideas




## Tri-Sine Bar Checks Precision Angles

An accurate check of angle plates or similar 90° work requires either expensive instruments or lengthy calculations. To use an indicator and invert the work is only feasible when the part has four sides to be squared or at least two sides parallel.

To overcome this limitation, the instrument shown is a valuable asset to any toolmaker. Its precision will depend on the care taken in its construction, but it is no more difficult to make than a fine die, jig, or fixture. An indicator stand or a good surface gage will support a dial indicator.

The work and tri-sine bar are set on an accurate surface plate with the bar against the work. Then the indicator is zeroed out on gage blocks to exactly 3 in. The indicator is then transferred to the top of the outer roll of the bar. Any variation from the zero setting is divided by 4 and then multiplied by the height of the work in inches. This will show how much more, or less, the work surface deviates from 90° over its entire height. After corrections on the work have been made, the process is repeated until a zero reading on the indicator is obtained.

The rolls are made of tool steel which, after hardening, are finish-ground to 1.000-in. dia. The center block is made of CR steel and can be case hardened if desired. The angles and roll seats present the greatest machining challenge. Both are dimensionally critical. First the angles must be exact because they govern the locations of the roll seats, and secondly each side of the seat must be equally distanced from the centerlines. After the machining is completed on the center block, the rolls are assembled with 10-32 capscrews.

(Note: Applying the proper trig, it would seem that this tri-sine bar and process are equally valuable in checking tapers and angles other than 90° as well. Ed)

*Detlef Schilling, Toronto, Canada*

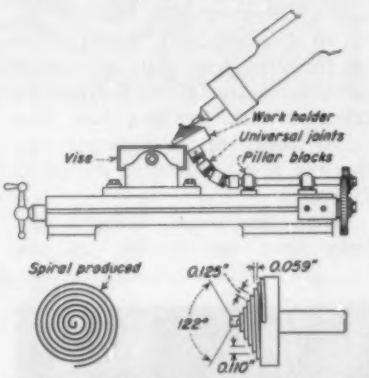
## Difficult Part Produced With Novel Milling Machine Setup

When one of our customers recently asked us to make him a mandrel for winding 0.050-in.-dia tungsten wire into spirals with 6 turns, spaced 0.110 in. apart, we were temporarily without an answer. The severe 122° included angle on the face of the mandrel made it impossible to produce with the lathe taper attachment or any other conceivable lathe setup.

The milling machine and dividing head was also rejected because the head would have to be geared to the miller-table feedscrew at the prohibitive ratio of 64 to 1.

Instead, we decided to erect the special milling arrangement shown, employing the table feedscrew to rotate the work. Two inexpensive pillow blocks carry the drive shaft, which is coupled to the work by two universal joints. The other end of the shaft takes a gear that is part of the gearing designed to produce the equivalent feed of 8 tpi.

The actual workholder is a block




bored out to receive the workpiece. A stop collar is fitted to the protruding end of this mandrel shaft, between the workholder and the universal joint, to remove any and all but the rotating motion.

A machine vise, bolted to the miller table, grips the workholder at an angle to put the face of the work parallel with the table. The vertical milling head, equipped with a 1/16-in. ball-end mill, is inclined to an angle closely approximating that of the workholder. As the work is rotated, the table feed moves the work in under the cutter, which cuts from the outside edge to the center of the work.

*Sidney C Harden, Lynn, Mass*

**HARRY MILLER**
**Sarasota, Florida**

won **$25** in addition to regular payment for his idea:

**ADAPTER PROVIDES CENTER**
**in the Oct 21, 1957 issue**

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

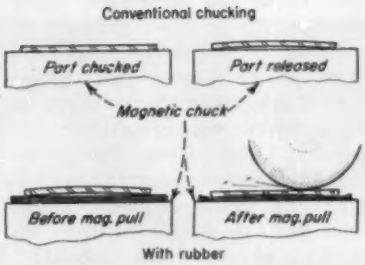
**GRAND PRIZE OF $100.**

**JUDGES**—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

**REQUIREMENTS**—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

**WHO MAY ENTER** — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

**HOW TO ENTER** — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.




## Rubber Helps Stabilize Thin Parts on Magnetic Chuck

To surface grind thin warped steel parts on a magnetic chuck is sometimes difficult; the parts remain warped despite repeated grinding. The magnetic force clamps the parts to the chuck's surface, removing the warpage, but on release it will reappear.

We have remedied this situation by interposing a thin sheet of soft rubber (about 0.020 in.) between the part and the chuck surface. The rubber helps the part to retain its original shape when the chuck is turned on. The projecting high-spots will imbed themselves further into the rubber than the rest of the part.

Thus, one pass may be enough on a piece that isn't too badly warped, whereas two or three reversals will be necessary in more severe cases, to correct the distortion. In any event, a better degree of accuracy can be obtained when the part is supported in this way.

*M. Barash, Prestwich, England*

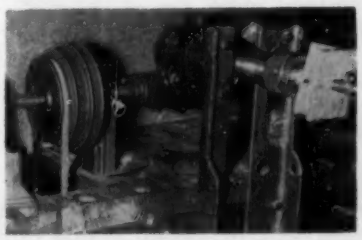
## Simple Arithmetic Finds Screw Diameter

Charts are fine, and many times invaluable, but they are also easily misplaced or they must be looked up in handbooks. To find the diameter of number screws, anyone capable of multiplying and adding can come up with the answer in less than a minute without the help of charts.

There are only two things to remember: One is that machine screws advance in increments of 0.013 in.; the other is that a number 0 screw is 0.060 in. in diameter. This, then, is your standard. The diameter of any screw is found by multiplying its number by 0.013, the result is then added to 0.060 in. For example: To find the diameter of a number 10 screw, multiply 10 by 0.013 in. giving you a product of 0.130 in. Add this to 0.060 in. and you have your answer, the sum of 0.190 in.

This is a little-known fact, but once you have become accustomed to using the formula, you can forget your screw-diameter chart. Incidentally, this formula can also be applied to find wood-screw diameters.

*J C Magee, Schenectady, NY*



## Discarded Gear Box Made Useful

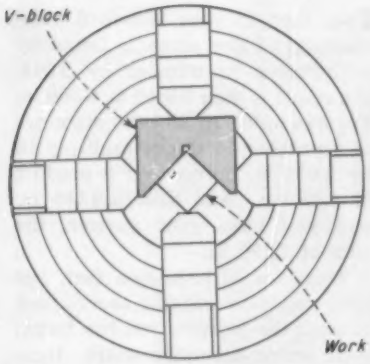
If you need a low-rpm drive, and you can't get next to a lathe, don't give up. An old auto steering-gear box may fill your need. We were recently faced with such a situation when we had a number of electrical coils to wind. To get the job done, we set up the temporary rig shown in the photo. It has more or less become permanent since then because of other uses.

We picked up the gear box in an auto junk yard and mounted it on the bench between a wooden block and a pair of angle irons. A motor under the bench provided the power through a V-belt and step pulleys. The reduction shaft was fitted with a standard key chuck.

An arbor with two coil-form plates can be seen mounted in the chuck. Hand-held parts can easily be deburred with the proper tool in the chuck. Tapping can also be done when the shaft is fitted with a tapping head.

*Harry J Miller, Sarasota, Fla*

# Practical Ideas



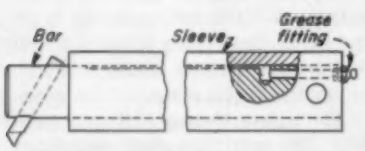

## V-Block Cuts Centering Time

After turning a few pieces from square stock, we saw ourselves losing a lot of time in centering each piece. It seemed natural to use a four-jaw chuck for square stock, and although it was necessary to operate only two adjacent jaws to release and rechuck a piece, all jaws had to be fully adjusted to center each piece individually.

The sketch above shows how we cut setup time to a minimum. We chucked a small V-block in the lathe chuck in conjunction with the first workpiece. Each flat of the work was then indicated to run true. The V-block was thus held by three of the four jaws, making them stationary.

From this point on it was possible, by using one jaw to grip and release a workpiece, to achieve satisfactory accuracy without further adjustments. This operation closely resembles that of a machine vise in use.

*S Clark, East Bradenton, Fla*



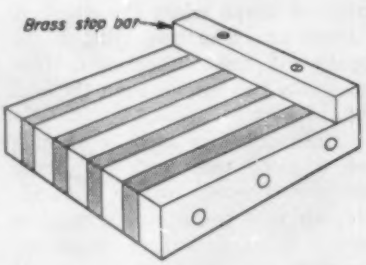

## Two-Piece Boring-Bar "Springs"

We do a lot of boring and internal threading on stainless steel and other tough materials. These make ordinary boring bars "wind up" and bend during cutting, causing the tool to dig in and resulting in poor finish and sometimes costly damage.

To correct this condition we have developed a spring-type boring bar. It is a two-piece bar made up of a lighter-than-usual bar encased in a steel sleeve. The sleeve, running the full length of the bar up to the toolbit, is pinned at the back end. A grease fitting is inserted into a lubricating hole in the end of the bar. This connects to a flat on the side of the bar, providing a method of lubrication between the two parts.

In use, the tube is held in a conventional boring-bar holder at any point along its length. When the tool catches in the work, the bar readily "winds up" because of its relatively small diameter. This rotation brings the tool slightly out of action to clear it before the pressure is too great to bend the supporting sleeve.

*Clifford Molloy, Bronx, NY*



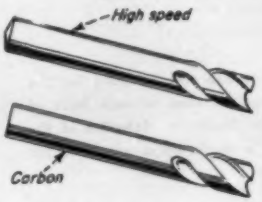

## Tapered Magnetic Parallel Simplifies Clearance Grinding

To grind clearance on die-block inserts and punches is not a difficult task, but it does involve a makeshift procedure; that of placing shims under the edge opposite the one to be relieved. After having ground clearances this way for years, I decided to standardize this job and make it as simple as grinding parallel blocks.

We first put together some steel and brass bars with long brass rods which were riveted at both ends. The assembly was then machined and ground all over, finished with the desired taper across the laminations. A brass stop bar was secured by machine screws to the thinnest edge of the parallel in perfect squareness to the taper.

The illustration shows one of these parallels. Its taper has been drawn in exaggeration to clarify the idea. Actually our blocks have less than 1° taper, but will vary with individual requirements.

*Howard Levy, Brooklyn, NY*




## Drill Identification

It is sometimes important to know if a drill is made of carbon or high-speed steel. Because chuck wear eventually renders shank markings illegible, we mark our drills as soon as they are removed from their packs.

A blunt point on the end of the shank is our identifying mark on a high speed drill. Carbon drills are ground flat. The efficiency of the drills are not affected in any way by these marks, but they make the drills easily distinguishable.

*H Miller, Philadelphia, Penna*

## Plug Preserves Accuracy of Tailstock Spindle

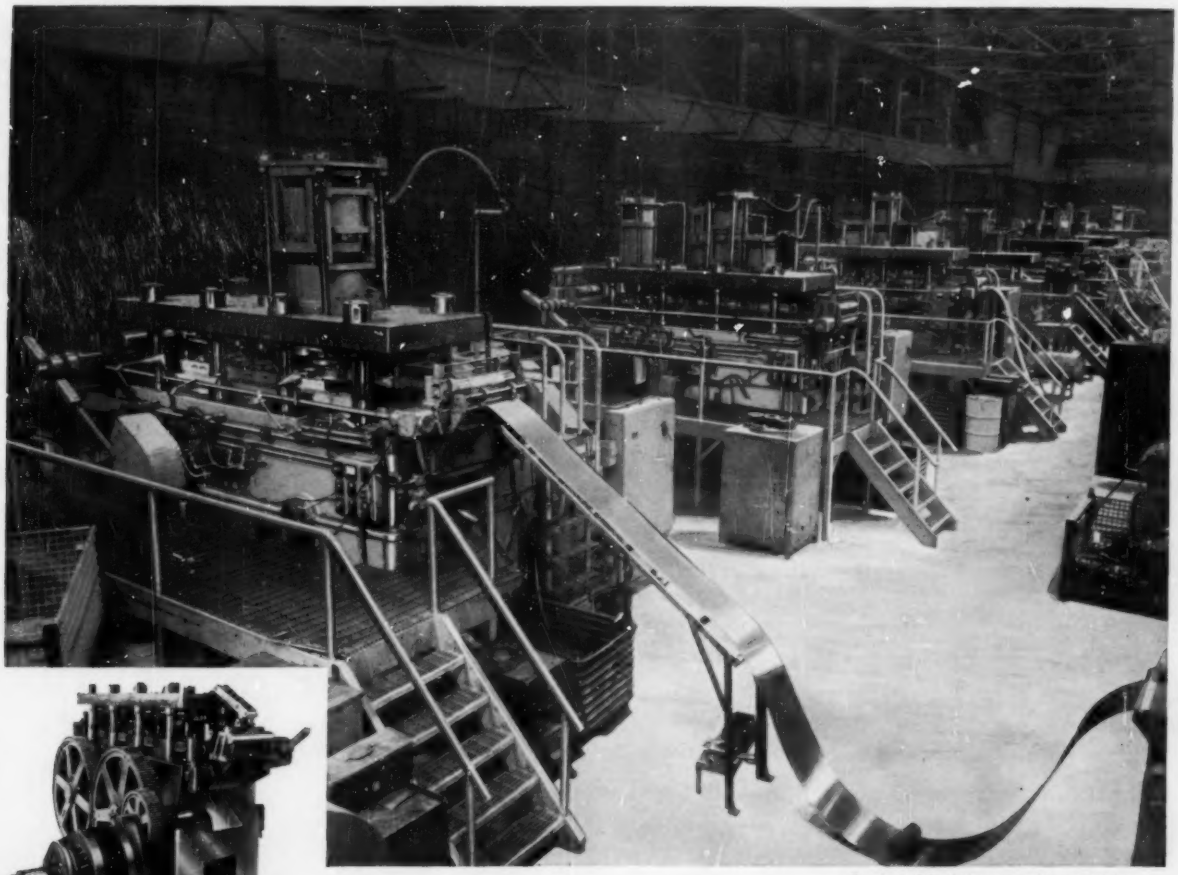
We have made it a hard and fast rule never to leave the tapered socket of the tailstock spindle unoccupied. As soon as a center, drill chuck, or any other tool is removed, we immediately plug the socket to prevent chips, however minute, from entering.

Small particles are sometimes left on the inside surface in spite of careful wiping or blowing. If caught between the bore and a tool shank, they make small indentations and burrs. Added up, this can cause inaccuracy which will eventually require remachining.

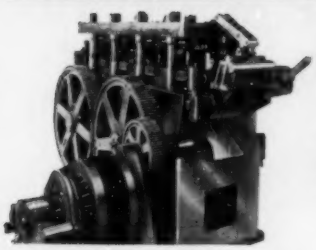
An ordinary cork does a good job of plugging. If none is handy, a piece of thoroughly dried wood can be turned to fit the bore.

*H Josephs, Gardenville, Penna*

# Seven 300-Ton Brandes Presses at FORD Stamp Huge Runs on 12′ Progressive Dies



Courtesy of Ford Motor Co., Monroe, Michigan



*Rear View of one of the above Brandes 300-Ton Double Crank Presses.*

Illustrated above are Brandes 300-Ton Double Crank Presses at the Ford Stamping Plant, Monroe, Michigan. These presses utilize 9-station, 12-ft. progressive dies to produce headlamp housings, hub caps, ball ring retainers at 24 to 28 strokes per minute. The tremendous length of the dies (*Brandes designed and built the first 12-ft. die*) plus the extreme accuracy of alignment built into the press give phenomenal runs between grinds. The overall height of these Brandes 300-Ton Double Crank Presses is only 9 ft. These presses are *not* installed in pits, giving greater versatility and low cost installation. Designed for versatility and proven in production for over 5 years, the installation at Ford permits continuing stamping economies with only tooling changes for new styles and models. Brandes will build your press and design your tooling to give you the greatest cost savings in progressive die stampings.

Brandes Builds Presses from 30-ton to over 4,000-ton capacity.

## The BRANDES PRESS CO.

**6408 EUCLID AVENUE, CLEVELAND 3, OHIO**

Write for NEW SPECIFICATION Catalog

# ANNOUNCING!

## VICKERS® New ¼" Temperature and Pressure Compensated FLOW CONTROL VALVE

ANOTHER VICKERS FIRST

FOR OPERATING PRESSURES UP TO 2000 psi

For years the Machine Tool Industry has been asking for a combination Temperature and Pressure Compensated Flow Control Valve to insure CONSTANT FEED RATES. Now for the first time it is available as a production unit at a reasonable price.

### Check THESE EXCLUSIVE FEATURES that mean Optimum Tool Life and Better Work Finish:

- **TEMPERATURE COMPENSATED**
  Constant feed rates all day long with same throttle setting because throttle automatically compensates for changes in oil temperature. The compensator mechanism is simple in design and durable.
- **PRESSURE COMPENSATED**
  Constant feed rate throughout entire cycle because built-in pressure hydrostat automatically compensates for load changes.
- **SINGLE THROTTLE COMPLETE RANGE ADJUSTMENT**
  Greater flexibility because valve is adjustable within entire flow range of 5 to 1000 cubic inches per minute.
- **REVERSE FREE FLOW AS STANDARD FEATURE**
  A standard feature which permits reverse free flow (up to 1400 cu. in. per min.) from outlet to inlet port by-passing control elements.
- **TAMPER-PROOF ADJUSTMENT**
  Retension of original feed rate is assured because a set screw prevents inadvertent throttle movement and a cover over the set screw can be locked in place.
- **INTERCHANGEABLE**
  This new valve replaces 12 previous models and it is interchangeable with all of them, also the drain connection is eliminated on the new valve to simplify piping.
- **GREATER ECONOMY**
  No need to stock several valves for wide range of flow rates. Drain connection is eliminated, piping costs are reduced.
- **MAXIMUM RELIABILITY AND ACCURACY**
  Design of temperature and pressure control components assures maximum circuit reliability and extreme accuracy of feed through a range of 5 to 1000 cubic inches per minute.

FOR ADDITIONAL INFORMATION SEND FOR I-195040 7945

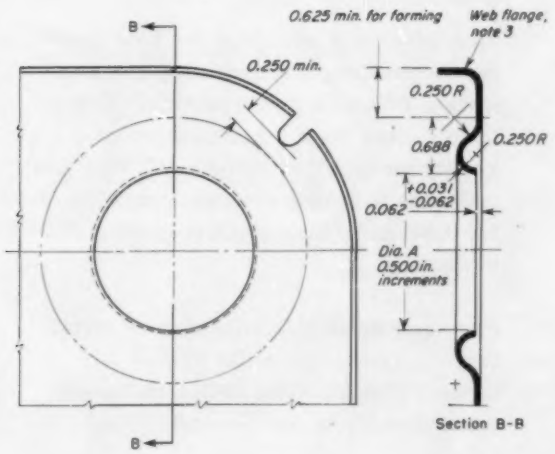
**VICKERS INCORPORATED**
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
Department 1410 • Detroit 32, Michigan

*Application Engineering Offices:* ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.) PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) PORTLAND, ORE. • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA • WORCESTER
FACTORIES ALSO IN AUSTRALIA, ENGLAND AND GERMANY
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto and Montreal

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

# Forming Data for Part Details . . IV

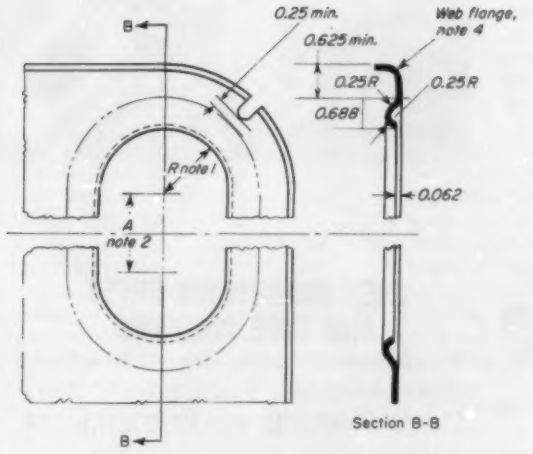
COURTESY REPUBLIC AVIATION CORP, FARMINGDALE, LI, NY




## Standard Internal Flanged Hole

**NOTES:**

1. Dia *A* to be in 0.500 in. increments. Minimum dia to be 2.000 in.
2. Maximum material gage = 0.064 in
3. Not suitable where spotwelding of web flange is desired. Hole flange generally interferes with electrode
4. May be formed in all aluminum alloys, annealed corrosion and heat-resisting steels, and titanium alloy.




## Lightening Hole—Elongated Internal

**NOTES:**

1. *R*—to be in 1.00 in. increments with 1.00 *R* min.
2. *A*—this dimension to be in 0.50 in. increments.
3. Maximum material thickness = 0.051 in.
4. Not suitable where spotwelding of web flange is desired. Hole flange, generally, interferes with electrode.
5. May be formed in all aluminum alloys, annealed corrosion and heat-resisting steels, magnesium and titanium alloy.



American REFERENCE

# *Youngstown cold finished bars*

## help build quality into Elastic Stop® nuts

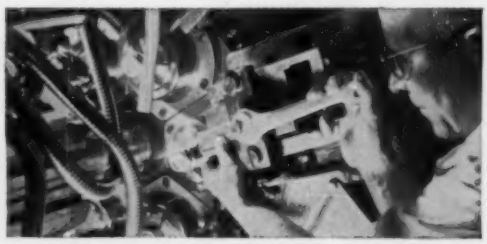
**One of the most important operations in producing Elastic Stop nuts from Youngstown Cold Finished Bars. Here the bar is being cut to length to form the basic nut blank. Six spindle screws of the Automatic drill and ream the tap hole, cut and form the unclosed crown, drill and ream the insert well and finally, cut off the finished nut blank. The cold finished bar's quality must not vary as any hidden seams, pipes or center segregations could cause tooling and production breakdowns.**

Youngstown Cold Finished Bars and Scrapless Nut Quality Wire play an important part in the "Elastic Stop Nut Story". They're the basic raw material used to produce these well-known self-locking fasteners familiar to almost every industry throughout the world.

These Youngstown products give Elastic Stop Nut Corporation of America long, trouble-free production runs. That's because they are quality-controlled throughout all of Youngstown's integrated steelmaking operations—from mining the iron ore to final cold drawing.

They give your operators the best chemical composition, physical structure and surface finish—a direct result of Youngstown's more than a half-century of quality steelmaking know-how. Why not make them your permanent specification for continuing high product quality and uniformity.

For more detailed information or metallurgical assistance, write or call our nearest District Sales Office today—or write directly to our General Office.



COLD FINISHED BARS
AND SCRAPLESS NUT
QUALITY WIRE

QUALITY YOUNGSTOWN SERVICE

**THE YOUNGSTOWN SHEET AND TUBE COMPANY**

*Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

# Shaving-Tool Corrections

I ZORICH, COLLEGE PARK, SOUTH AUSTRALIA

**NOMENCLATURE:**

- $c$ = step on work
- $d_1$ = smallest work dia shaved
- $d$ = any work dia for which tool step is to be corrected
- $D$ = dia of supporting roller
- $R$ = Distance from work center to roller center
- $p$ = tool travel past center
- $X$ = depth of tool to be corrected
- $y$ = length of cutting edge to form profile
- $Z = c - \Delta Z$
- $\Delta Z$ = vertical tool movement of tool edge, when floating toolholder passes center by distance $p$
- $\alpha$ = top rake angle
- $\beta$ = clearance angle
- $\psi$ = angle between tool top rake and a line drawn from intersection of top rake with work diameter to center of work

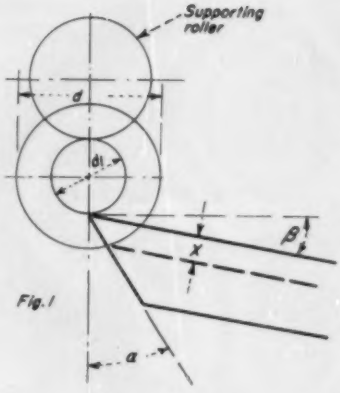


Fig. 1

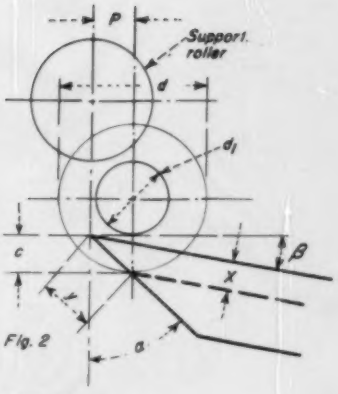


Fig. 2

**FORMULAS**

**For Fig 2**

$$c = \frac{d - d_1}{2}$$

$$p = c \times \tan \alpha$$

$$y = \frac{c}{\cos \alpha}$$

$$X = y \times \sin 90° - (\alpha + \beta)$$

$$= y \times \cos (\alpha + \beta)$$

$$= c \times \frac{\cos (\alpha + \beta)}{\cos \alpha} \quad \text{.....(3)}$$

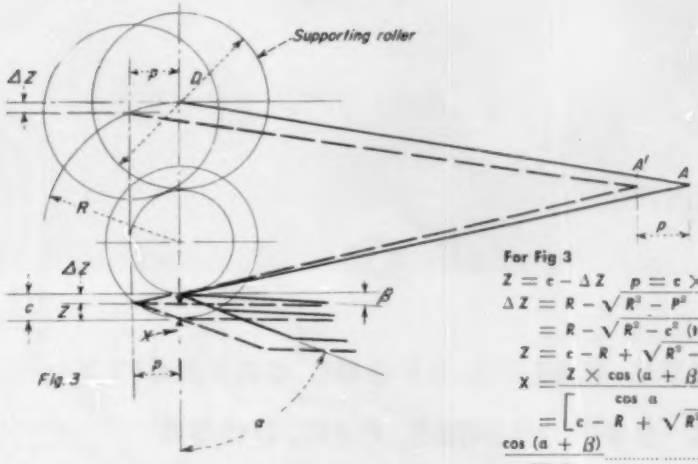


Fig. 3

**For Fig 3**

$$Z = c - \Delta Z \qquad p = c \times \tan \alpha$$

$$\Delta Z = R - \sqrt{R^2 - p^2}$$

$$= R - \sqrt{R^2 - c^2 (\tan \alpha)^2}$$

$$Z = c - R + \sqrt{R^2 - c^2 (\tan \alpha)^2}$$

$$X = \frac{Z \times \cos (\alpha + \beta)}{\cos \alpha}$$

$$= \left[c - R + \sqrt{R^2 - c^2 (\tan \alpha)^2}\right] \times \frac{\cos (\alpha + \beta)}{\cos \alpha} \quad \text{.....(4)}$$

Shaving operations are finding increased use on automatics and turret lathes. The edge of the shaving tool is always on a vertical line with the center of the supporting roller. Here are the formulas for shaving-tool tool corrections for three conditions:

CONDITION 1—The edge of the shaving tool and center of the supporting roller just reach the center of the work, Fig 1.

Formulas for tool correction are:

$$X = \frac{d \sin (\alpha - \psi) \cos (\alpha + \beta)}{2 \sin \alpha} \quad (1)$$

$$\sin \psi = \frac{d_1}{d} \sin \alpha \quad \text{.....(2)}$$

CONDITION 2—Edge of the shaving tool and centerline of the supporting roller pass the center of the work but the tool step cutting the other diameter just reaches the center of the work, Fig 2. The toolholder is nonfloating.

CONDITION 3—The setup in Fig 3 is the same as in Fig 2, except that the toolholder is floating. Here $A$ is the position when the edge of the shaving tool reaches work center and $A'$ is the position when the center is passed and the tool step reaches the center at the other diameter.

EXAMPLE (Fig 3):

What is the dimension of step $X$ when $c = 0.25$, $R = 2$, $\alpha = 15°$ and $\beta = 5°$?

$$X = \left[0.25 - 2 + \sqrt{4 - 0.0625 (\tan 20°)^2}\right] \times \frac{\cos 20°}{\cos 15°}$$

$$= 0.224$$

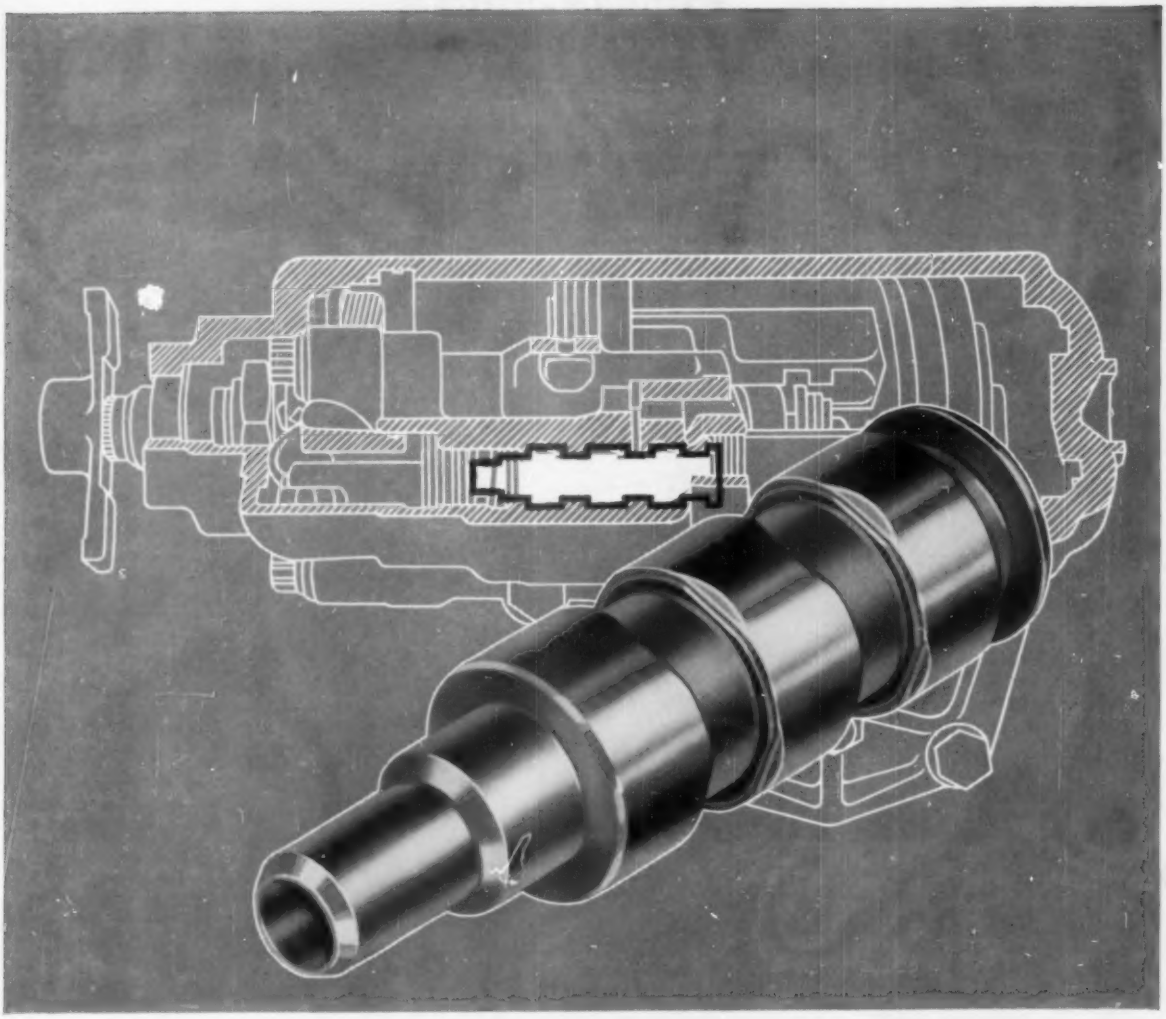
Under certain material and cutting conditions:

$(\tan \alpha)^2$ = a constant $K_1$

$\frac{\cos (\alpha + \beta)}{\cos \alpha}$ = constant $K_2$

Then:

$$X = \left[c - R + \sqrt{R^2 - c^2 \times K_1}\right] \times K_2$$

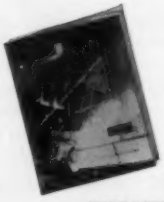


# LEDLOY* JUMPS VALVE SPOOL CAPACITY 138 TO 240 PIECES PER HOUR

By reducing friction between tool and chip, Ledloy "A" permitted one large automobile parts manufacturer to increase machining and spindle speeds 66%. Production correspondingly went from 144 pieces to 240 pieces per hour.

And the manufacturer goes on to say, "the quality of finished pieces went from poor to very good."

Ledloy is but one of a wide range of analyses which Copperweld can lead-treat for you. As specialists in the production of leaded carbon and alloy steels, we will be glad to send one of our field metallurgists to study your requirements. Call your nearest Copperweld district office today—start to enjoy the savings of "lead-lubricated" Aristoloy steels tomorrow.



**JUST OFF THE PRESS**

*New Leaded Steel Catalog. Write for your copy today.*

*Inland Ledloy License

ARISTOLOY STEELS

**COPPERWELD STEEL COMPANY • Steel Division**

4009 Mahoning Avenue • WARREN, OHIO

EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N.Y.

# Inch-Millimeter Conversion Tables

GUSTAV HIRSCH, technical manager, CHANITA METAL WORKS, CHANITA, ISRAEL

## TABLE I:

**Fractional inches to decimal inches — 0 to 1 in. by 64ths**
**Fractional inches to millimeters — 0 to 6 in. by 64ths**

| Inches | | 0" | 1" | 2" | 3" | 4" | 5" |
|---|---|---|---|---|---|---|---|
| | | Millimeters | | | | | |
| 0 | 0 | — | 25.400 | 50.800 | 76.200 | 101.600 | 127.000 |
| 1/64 | 0.015625 | 0.397 | 25.797 | 51.197 | 76.597 | 101.997 | 127.397 |
| 1/32 | 0.031250 | 0.794 | 26.194 | 51.594 | 76.994 | 102.394 | 127.794 |
| 3/64 | 0.046875 | 1.191 | 26.591 | 51.991 | 77.391 | 102.791 | 128.191 |
| 1/16 | 0.062500 | 1.588 | 26.988 | 52.388 | 77.788 | 103.188 | 128.588 |
| 5/64 | 0.078125 | 1.984 | 27.384 | 52.784 | 78.184 | 103.584 | 128.984 |
| 3/32 | 0.093750 | 2.381 | 27.781 | 53.181 | 78.581 | 103.981 | 129.381 |
| 7/64 | 0.109375 | 2.778 | 28.178 | 53.578 | 78.978 | 104.378 | 129.778 |
| 1/8 | 0.125000 | 3.175 | 28.575 | 53.975 | 79.375 | 104.775 | 130.175 |
| 9/64 | 0.140625 | 3.572 | 28.972 | 54.372 | 79.772 | 105.172 | 130.572 |
| 5/32 | 0.156250 | 3.969 | 29.369 | 54.769 | 80.169 | 105.569 | 130.969 |
| 11/64 | 0.171875 | 4.366 | 29.766 | 55.166 | 80.566 | 105.966 | 131.366 |
| 3/16 | 0.187500 | 4.762 | 30.162 | 55.562 | 80.962 | 106.362 | 131.762 |
| 13/64 | 0.203125 | 5.159 | 30.559 | 55.959 | 81.359 | 106.759 | 132.159 |
| 7/32 | 0.218750 | 5.556 | 30.956 | 56.356 | 81.756 | 107.156 | 132.556 |
| 15/64 | 0.234375 | 5.953 | 31.353 | 56.753 | 82.153 | 107.553 | 132.953 |
| 1/4 | 0.250000 | 6.350 | 31.750 | 57.150 | 82.550 | 107.950 | 133.350 |
| 17/64 | 0.265625 | 6.747 | 32.147 | 57.547 | 82.947 | 108.347 | 133.747 |
| 9/32 | 0.281250 | 7.144 | 32.544 | 57.944 | 83.344 | 108.744 | 134.144 |
| 19/64 | 0.296875 | 7.541 | 32.941 | 58.341 | 83.741 | 109.141 | 134.541 |
| 5/16 | 0.312500 | 7.938 | 33.338 | 58.738 | 84.138 | 109.538 | 134.938 |
| 21/64 | 0.328125 | 8.334 | 33.734 | 59.134 | 84.534 | 109.934 | 135.334 |
| 11/32 | 0.343750 | 8.731 | 34.131 | 59.531 | 84.931 | 110.331 | 135.731 |
| 23/64 | 0.359375 | 9.128 | 34.528 | 59.928 | 85.328 | 110.728 | 136.128 |
| 3/8 | 0.375000 | 9.525 | 34.925 | 60.325 | 85.725 | 111.125 | 136.525 |
| 25/64 | 0.390625 | 9.922 | 35.322 | 60.722 | 86.122 | 111.522 | 136.922 |
| 13/32 | 0.406250 | 10.319 | 35.719 | 61.119 | 86.519 | 111.919 | 137.319 |
| 27/64 | 0.421875 | 10.716 | 36.116 | 61.516 | 86.916 | 112.316 | 137.716 |
| 7/16 | 0.437500 | 11.112 | 36.512 | 61.912 | 87.312 | 112.712 | 138.112 |
| 29/64 | 0.453125 | 11.509 | 36.909 | 62.309 | 87.709 | 113.109 | 138.509 |
| 15/32 | 0.468750 | 11.906 | 37.306 | 62.706 | 88.106 | 113.506 | 138.906 |
| 31/64 | 0.484375 | 12.303 | 37.703 | 63.103 | 88.503 | 113.903 | 139.303 |
| 1/2 | 0.500000 | 12.700 | 38.100 | 63.500 | 88.900 | 114.300 | 139.700 |

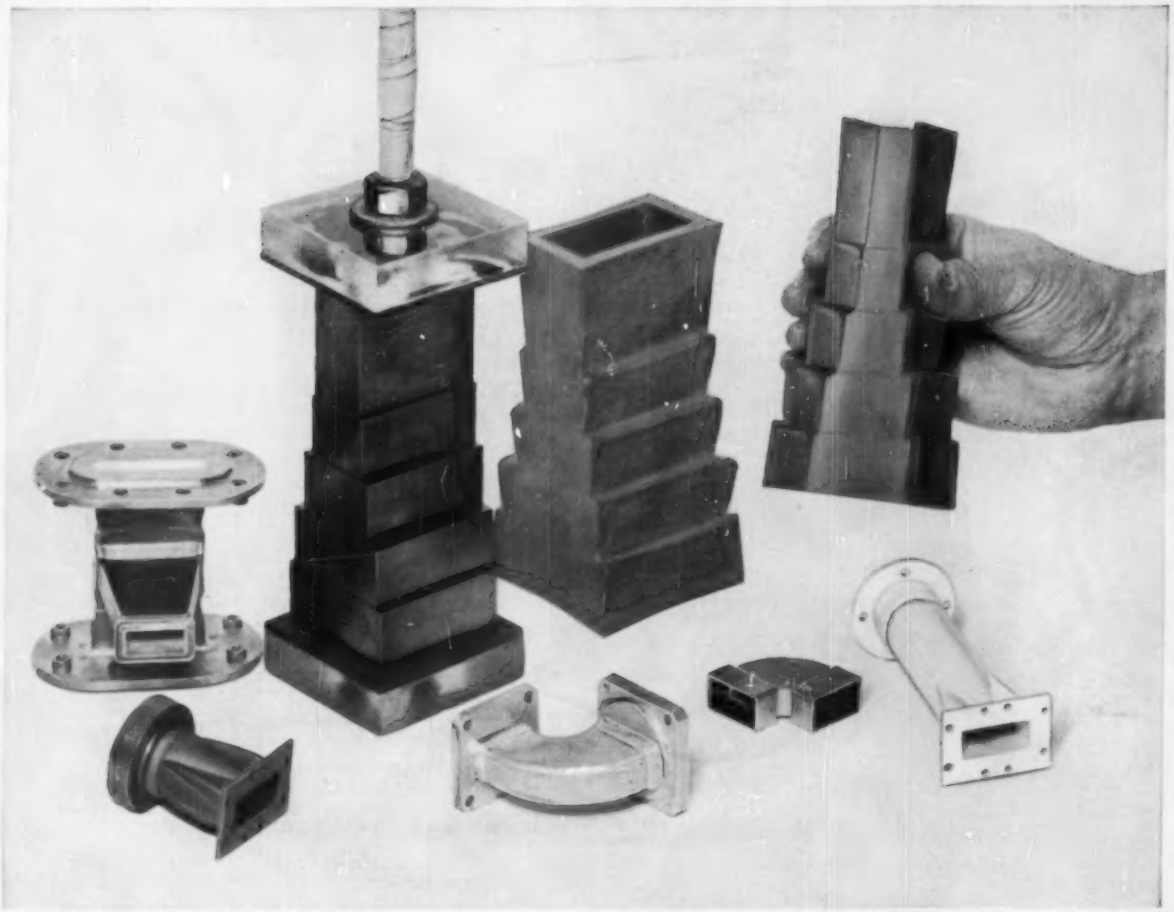
| Inches | | 0" | 1" | 2" | 3" | 4" | 5" |
|---|---|---|---|---|---|---|---|
| | | Millimeters | | | | | |
| 33/64 | 0.515625 | 13.097 | 38.497 | 63.897 | 89.297 | 114.697 | 140.097 |
| 17/32 | 0.531250 | 13.494 | 38.894 | 64.294 | 89.694 | 115.094 | 140.494 |
| 35/64 | 0.546875 | 13.891 | 39.291 | 64.691 | 90.091 | 115.491 | 140.891 |
| 9/16 | 0.562500 | 14.288 | 39.688 | 65.088 | 90.488 | 115.888 | 141.288 |
| 37/64 | 0.578125 | 14.684 | 40.084 | 65.484 | 90.884 | 116.284 | 141.684 |
| 19/32 | 0.593750 | 15.081 | 40.481 | 65.881 | 91.281 | 116.681 | 142.081 |
| 39/64 | 0.609375 | 15.478 | 40.878 | 66.278 | 91.678 | 117.078 | 142.478 |
| 5/8 | 0.625000 | 15.875 | 41.275 | 66.675 | 92.075 | 117.475 | 142.875 |
| 41/64 | 0.640625 | 16.272 | 41.672 | 67.072 | 92.472 | 117.872 | 143.272 |
| 21/32 | 0.656250 | 16.669 | 42.069 | 67.469 | 92.869 | 118.269 | 143.669 |
| 43/64 | 0.671875 | 17.066 | 42.466 | 67.866 | 93.266 | 118.666 | 144.066 |
| 11/16 | 0.687500 | 17.462 | 42.662 | 68.262 | 93.662 | 119.062 | 144.462 |
| 45/64 | 0.703125 | 17.859 | 43.259 | 68.659 | 94.059 | 119.459 | 144.859 |
| 23/32 | 0.718750 | 18.256 | 43.656 | 69.056 | 94.456 | 119.856 | 145.256 |
| 47/64 | 0.734375 | 18.653 | 44.053 | 69.453 | 84.853 | 120.253 | 145.653 |
| 3/4 | 0.750000 | 19.050 | 44.450 | 69.850 | 95.250 | 120.650 | 146.050 |
| 49/64 | 0.765625 | 19.447 | 44.847 | 70.247 | 95.647 | 121.047 | 146.447 |
| 25/32 | 0.781250 | 19.844 | 45.244 | 70.644 | 96.044 | 121.444 | 146.844 |
| 51/64 | 0.796875 | 20.241 | 45.641 | 71.041 | 96.441 | 121.841 | 147.241 |
| 13/16 | 0.812500 | 20.638 | 46.038 | 71.438 | 96.838 | 122.238 | 147.638 |
| 53/64 | 0.828125 | 21.034 | 46.434 | 71.834 | 97.234 | 122.634 | 148.034 |
| 27/32 | 0.843750 | 21.431 | 46.831 | 72.231 | 97.631 | 123.031 | 148.431 |
| 55/64 | 0.859375 | 21.828 | 47.228 | 72.628 | 98.028 | 123.428 | 148.828 |
| 7/8 | 0.875000 | 22.225 | 47.625 | 73.025 | 98.425 | 123.825 | 149.225 |
| 57/64 | 0.890625 | 22.622 | 48.022 | 73.422 | 98.822 | 124.222 | 149.622 |
| 29/32 | 0.906250 | 23.019 | 48.419 | 73.819 | 99.219 | 124.619 | 150.019 |
| 59/64 | 0.921875 | 23.416 | 48.816 | 74.216 | 99.616 | 125.016 | 150.416 |
| 15/16 | 0.937500 | 23.812 | 49.212 | 74.612 | 100.012 | 125.412 | 150.812 |
| 61/64 | 0.953125 | 24.209 | 49.609 | 75.009 | 100.409 | 125.809 | 151.209 |
| 31/32 | 0.968750 | 24.606 | 50.006 | 75.406 | 100.806 | 126.206 | 151.606 |
| 63/64 | 0.984375 | 25.003 | 50.403 | 75.803 | 101.203 | 126.603 | 152.003 |

1 mm = 0.3937008 in. 1 in. = 25.4 mm

| mm | In./mm | In. | mm | In./mm | In. | mm | In./mm | In. | mm | In./mm | In. | mm | In./mm | In. | mm | In./mm | In. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25.4 | 1 | 0.39370 | 533.4 | 21 | 8.26772 | 1041.4 | 41 | 16.14173 | 1422.4 | 56 | 2.204724 | 1803.4 | 71 | 2.795276 | 2184.4 | 86 | 3.385827 |
| 50.8 | 2 | 0.78840 | 558.8 | 22 | 8.66142 | 1066.8 | 42 | 16.53543 | 1447.8 | 57 | 2.244094 | 1828.8 | 72 | 2.834646 | 2209.8 | 87 | 3.425197 |
| 76.2 | 3 | 1.18110 | 584.2 | 23 | 9.05512 | 1092.2 | 43 | 16.92913 | 1473.2 | 58 | 2.283465 | 1854.2 | 73 | 2.847106 | 2235.2 | 88 | 3.464567 |
| 101.6 | 4 | 1.57480 | 609.6 | 24 | 9.44882 | 1117.6 | 44 | 17.32283 | 1498.6 | 59 | 2.322835 | 1879.6 | 74 | 2.913386 | 2260.6 | 89 | 3.503937 |
| 127.0 | 5 | 1.96850 | 635.0 | 25 | 9.84252 | 1143.0 | 45 | 17.71654 | 1524.0 | 60 | 2.362205 | 1905.0 | 75 | 2.952756 | 2286.0 | 90 | 3.543307 |
| 152.4 | 6 | 2.36220 | 660.4 | 26 | 10.23622 | 1168.4 | 46 | 18.11024 | 1549.4 | 61 | 2.401575 | 1930.4 | 76 | 2.992126 | 2311.4 | 91 | 3.582677 |
| 177.8 | 7 | 2.75591 | 685.8 | 27 | 10.62992 | 1193.8 | 47 | 18.50394 | 1574.8 | 62 | 2.440945 | 1955.8 | 77 | 3.031496 | 2336.8 | 92 | 3.622047 |
| 203.2 | 8 | 3.14961 | 711.2 | 28 | 11.02362 | 1219.2 | 48 | 18.89764 | 1600.2 | 63 | 2.480315 | 1981.2 | 78 | 3.070866 | 2362.2 | 93 | 3.661417 |
| 228.6 | 9 | 3.54331 | 736.6 | 29 | 11.41732 | 1244.6 | 49 | 19.29134 | 1625.6 | 64 | 2.519685 | 2006.6 | 79 | 3.110236 | 2387.6 | 94 | 3.700787 |
| 254.0 | 10 | 3.93701 | 762.0 | 30 | 11.81102 | 1270.0 | 50 | 19.68504 | 1651.0 | 65 | 2.559055 | 2032.0 | 80 | 3.149606 | 2413.0 | 95 | 3.740157 |
| 279.4 | 11 | 4.33071 | 787.4 | 31 | 12.20472 | 1295.4 | 51 | 2.007874 | 1676.4 | 66 | 2.598425 | 2057.4 | 81 | 3.188976 | 2438.4 | 96 | 3.779528 |
| 304.8 | 12 | 4.72441 | 812.8 | 32 | 12.59843 | 1320.8 | 52 | 2.047244 | 1701.8 | 67 | 2.637795 | 2082.8 | 82 | 3.228346 | 2463.8 | 97 | 3.818698 |
| 330.2 | 13 | 5.11811 | 838.2 | 33 | 12.92213 | 1346.2 | 53 | 2.086614 | 1727.2 | 68 | 2.677165 | 2108.2 | 83 | 3.267717 | 2489.2 | 98 | 3.858268 |
| 355.6 | 14 | 5.51181 | 863.6 | 34 | 13.38583 | 1371.6 | 54 | 2.125984 | 1752.6 | 69 | 2.716535 | 2133.6 | 84 | 3.307087 | 2514.6 | 99 | 3.897638 |
| 381.0 | 15 | 5.90551 | 889.0 | 35 | 13.77953 | 1397.0 | 55 | 2.165354 | 1778.0 | 70 | 2.755906 | 2159.0 | 85 | 3.346457 | 2540.0 | 100 | 3.937008 |
| 406.4 | 16 | 6.29921 | 914.4 | 36 | 14.17323 | | | | | | | | | | | | |
| 431.8 | 17 | 6.69291 | 939.8 | 37 | 14.56693 | | | | | | | | | | | | |
| 457.2 | 18 | 7.08661 | 965.2 | 38 | 14.96063 | | | | | | | | | | | | |
| 482.6 | 19 | 7.48031 | 990.6 | 39 | 15.35433 | | | | | | | | | | | | |
| 508.0 | 20 | 7.87402 | 1016.0 | 40 | 15.74803 | | | | | | | | | | | | |

## TABLE II:

**Inches to millimeters — 1 to 100 in. by 1-in. steps**
**Millimeters to inches — 1 to 100 mm by 1-mm steps**



A few typical Gar high-precision products. At left in the center is a stainless steel mandrel on which copper is deposited to form the microwave step transformer (center). Cutaway section of transformer is held at right. Parts with more complex shapes are formed on expendable mandrels. Machined components, such as flanges and iris plates, can be fitted to mandrels and "grown" in place, eliminating need for brazing or soldering which would distort tolerances.

# Periodic-reverse plating with "Plus-4" Anodes helps GAR mass-produce extreme-precision parts

The parts above are electroformed components for radar and microwave communication systems. Their complex inside surfaces must be exceptionally accurate in form and dimension. GAR Precision Parts, Inc., Stamford, Conn., has developed the art of electroforming such close-tolerance products into a practical mass-production process by the use of periodic-reverse acid-copper electroplating with "Plus-4"® Anodes — Anaconda's phosphorized copper anodes.

**Periodic-reverse plating** (5 seconds of plating and 1 second of deplating is a common cycle) has a leveling effect on the deposit, helps produce more uniform wall thickness — particularly important in irregular shapes and thickness up to .125".

**"Plus-4" Anodes** make the following contributions to the process:

1. Better anode corrosion—15% to 20% more usable copper.
2. Denser, smoother deposits with finer grain. Gar states this gives finished plate 10% greater tensile strength, makes finish-machining easier.
3. Rate of deposition is 8% to 10% faster for a constant amount of current.
4. More uniform build-up, without treeing. Heavier deposits can be made without intermediate grinding. Gar estimates 12% to 15% savings in copper.
5. Less sludge—no "bagging"—means easier tank maintenance, less down-time for cleaning.

**See for yourself** how "Plus-4" Anodes can simplify acid-copper electroplating and electroforming, reduce your costs. Write for information on how you can get a test quantity to supply one tank. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

57144B

**ANACONDA®**

**"PLUS-4"**

**Phosphorized Copper Anodes**

*made by THE AMERICAN BRASS COMPANY*

FOR USE UNDER PATENT NO. 2,689,216



NEWS REPORT

# Talking Shop...

### $25,000 Wasted?

ONE EDITOR RETURNED recently from a plant visit with a sad story. The company faced the problem of handling a tricky material they had never worked before. The heat-treating procedure was especially touchy and the company had spent $25,000 in a study to find out how to do it. Our editor caused a bit of a row when he told them we had published the heat-treating procedure for this material in some detail. It is doubtful if the data we published could have been applied to their special problems without any further study at all, but they could certainly have saved a chunk of that money. At the risk of sounding like a broken record, we say again: when you start on a new problem (new to you), start by checking the published literature. Don't waste time and money seeking solutions that have already been found.

### Machine Appearance

THE DIFFICULTY of satisfying a demand for good looks made by customers who won't admit ever considering such a factor was the subject of a recent inquiry by the editors of *Product Engineering*. The opinions collected are reported in their issue of Nov 18, '57, p32. One manufacturer concludes that users unconsciously associate good workmanship with good looks. At least a third of the machine tool builders replying mentioned that they are employing full or part-time industrial designers on the new models now in design stages.

One company said that in preparing advertising for a new model (in haste), a pencil drawing was made from the plan views. "It looked like a bunch of cardboard boxes piled up. Sales was so disturbed that an airbrush artist was hired and the exterior appearance smoothed out to more pleasing lines. Engineering then had to revamp the guts of the machine to fit our picture."

A better approach, followed by some, is to work with an industrial designer, make scale and full-size models which are studied and revised by both engineering and sales.

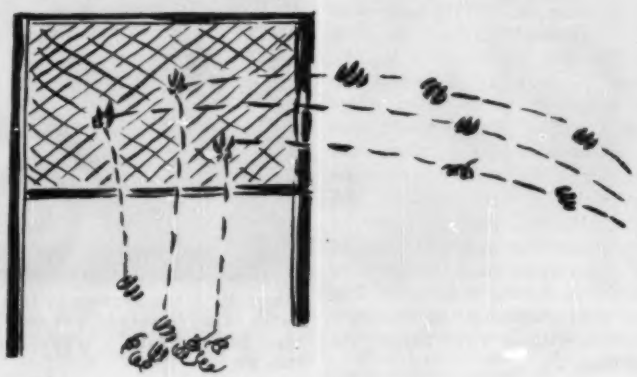
### Moly Cleaner

UNTIL RECENTLY there wasn't any really effective cleaner for molybdenum—existing methods were either dangerous to personnel or the metal, or couldn't be applied to formed aircraft parts. But Ryan Aeronautical Co's new chemical laboratory has come up with a two-bath method that works. First bath is a deoxidizer, including 10% sodium hydroxide and 5% potassium permanganate, held at 150-180 F. Parts are dipped for 5 to 10 min, and come out with surface oxides converted to a state of higher valence. A pressure spray rinse removes them, leaving only a black smut on the base metal.

Second bath is 15% sulphuric acid, 15% hydrochloric acid, and 6-10% chromic acid—remainder water. Parts are dipped for 5-10 min at room temperature, and come out chemically clean. Parts are being cleaned this way prior to welding.

### Chip Backstop

HOT FLYING CHIPS were discussed on this page a fortnight ago as a growing problem in high-speed machining. Now we've heard of a company that had the problem in forging titanium. Steel barriers led to dangerous ricochets. A woven-wire curtain made from 14-gage carbon steel by Cambridge Wire Cloth Co provided the right flexibility to catch the chips and drop them harmlessly to the floor. We'll bet a baseball player thought of that one.



### Priority

AT THIS SEASON of resolutions, we are reminded by our Melbourne correspondent of the following formula for determining the speed with which any problem can be solved:

$$\frac{NP}{Q}$$

In this classic formula N is the need for a solution, P is the promise of getting the answer out of the line of investigation chosen, and Q is the number of people working on the problem. In short, the more people on the committee, the less important it is to worry about their finding the solution. The danger of divided responsibility is thus cleverly made obvious. But we note that if nobody works on the problem, there is no solution either. It takes at least one.

### Adjustable-speed grinder

BOEING HAS CONVERTED a standard Model F grinder to a model that will produce the same torque at all speeds. Aim is to find the optimum grinding speed for titanium and other new materials. The 1½-hp electric motor was replaced with a Vickers hydraulic motor coupled to the grinding spindle. A 10-hp electric motor provides power to the hydraulic drive. The test grinder provides 120 in. lb of torque at 1000 psi and can operate at speeds to 3600 rpm.



NEWS REPORT

NEWS REPORT

# LABOR OUTLOOK: Three Way

**WASHINGTON—The first signs of January point to an explosive year in collective bargaining. All the potential trouble spots that began showing up in late 1957 are becoming more prominent. The latest figures on unemployment confirmed the concern over 1958; in November it climbed to 3.2 million—and it's headed above the four million mark in the next few months. The cost of living rose again in Nove..ber, with an advance of almost one-half of one percent—reflecting the increased costs of the new 1958 model automobiles.**

With these conflicting forces—rising unemployment and rising living costs—there's a third collective bargaining time-bomb. This is the pressure put on 1958 negotiations by the automatic wage increases already written into this year's contracts. The total is impressive:

- Some four million workers, covered by 530 running contracts, will get deferred wage increases this year. The heaviest proportion is in the metalworking industries—with just under 1.5-million workers assured of a pay raise without raising a finger at the bargaining table. Their pay will climb between 8¢ and 9¢ an hour under their running contract—with additional payments to come if the cost-of-living goes up.
- Less than half the total number of major contracts (covering 5000 or more workers) expire in 1958. The biggest worker total—4.4 million deferred-increase, 3.2 cost-of-living adjustments—receive automatic pay raises this year under contracts running at least through 1959.

### Mounting Pressure

This is the kind of pressure that could help—or hurt—union bargainers. If times are good, it can provide an automatic wage floor to shoot from and frequently better. But if production is slackening, jobs are falling, and inventories climbing, the impetus can hurt. It forces a union leader's hand when he might want to go slow.

Such a threat is just about to hit auto industry bargaining. Walter Reuther's United Auto Workers, without question, are the front-runners in 1958. The UAW will be joined by the International Association of Machinists, particularly in the aircraft industry. All major agreements in autos and aircraft expire in 1958. These total 266 agreements covering two million workers. They begin running out in the spring, starting in March, with the peak of contract terminations at the end of June.

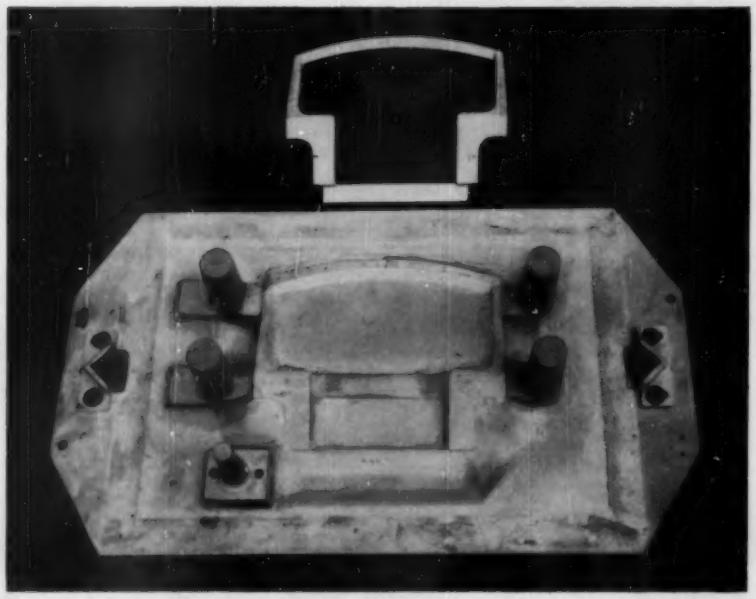
This is the picture. The unions are being forced into some heavy bargaining demands because of automatic pay hikes going to a majority of all industrial employes in 1958. Here's a clear-cut example:

### UAW on the Spot

Traditionally the Auto Workers and United Steel Workers are wage rivals; what happens in one industry on wages is usually a spark to the other union to do better. As the situation stands, Reuther's Auto

# New Aluminum Alloy Castings Replace

SANTA MONICA, CALIF — North American Aviation reports that Tens-50, a high-strength aluminum alloy developed by its Los Angeles Division, is being used in casting pylons and other parts for its F-100 Super Sabre jets—and has chalked up some remarkable savings in machining time over previously used forgings. Example: a part that formerly cost $350 to mill from bar stock is being cast for about $15, without loss of weight-to-strength ratio. Casting of jet pylons was done by Rayson Casting & Mfg Co of Gardena, Calif, after an experimental casting of a racing car brake formerly made from magnesium. Castings from Tens-50 also went out to several of Rayson customers for evaluation of machinability, welding characteristics, and the like. Rayson perfected gating practices, and was given the run of North American's pilot foundry to help improve casting techniques. The result: pylon castings in quantity production, with an x-ray reject rate of less than 1%.



Simplicity is the keynote in this sand mold pattern, from which an F-100 Super Sabre canopy breaker was cast from Tens-50 at savings in machining of more than $300 per part. A typical melt: tensile strength 46,850; yield 36,000; elongation 3%



NEWS REPORT

NEWS REPORT

# Squeeze Will Stiffen Demands

Workers earn 25¢ an hour less, on the average, than David McDonald's Steelworkers, whose rate is $2.47 an hour. On top of this differential, the Steelworkers are assured at least 8¢ more in deferred boosts in 1958, plus whatever they can get in living cost advances. Reuther must try and cut into this differential in bargaining with the major auto producers. And he must make up a good chunk of the difference.

Another example is the Machinist's Union: on the one hand, a number of its aircraft and metalworking contracts expire this year; on the other, many of its agreements run through 1958 with the automatic boosts coming up. For instance, 6400 IAM members employed by the California Metal Trades Association on July 1 got an 11¢-an-hour pay boost. And at Sperry-Rand in Long Island, 5600 Machinist members collect 5 to 10¢ next September. But at Boeing Aircraft, Douglas Aircraft and elsewhere, the Machinists must bargain out a new contract in an industry where defense layoffs have led the unemployment advance.

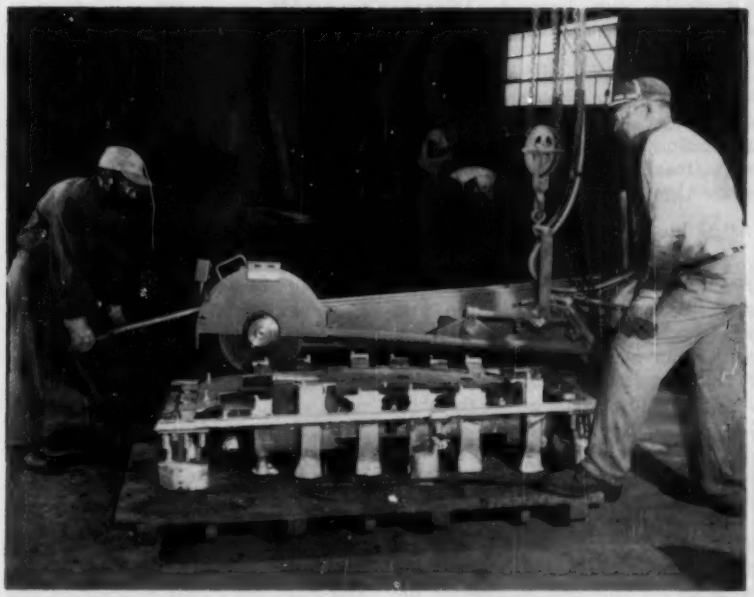
The International Union of Electrical Workers have a different problem. At General Electric Co and Westinghouse, the IUE's 130,000 members are covered by a contract running until 1960—with automatic pay raises ranging from 5 to 12¢ this year, payable in October. They also get quarterly living cost adjustments. But the Union, headed by James B Carey, also has a re-opening clause that permits negotiation of some type of supplementary unemployment benefits, such as Reuther's union now has. With this re-opening, the electrical union is expected to make its demands, but the economic picture isn't going to provide much support.

This labor conflict of poor bargaining atmosphere combined with pressure for sizable demands can lead to a very stormy 1958. It's almost a sure bet that strikes will come, and certain that they'll outdo last year's record. In 1957, strikes were at the lowest point since World War II. And there were few big strikes, one of the largest affected only 16,000 workers in the cement industry. This one lasted several months. There were no others that serious.

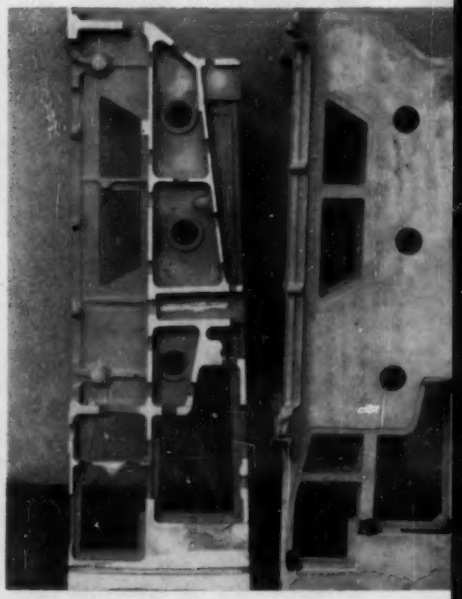
It's anybody's guess, at this point, what the 1958 settlement picture will look like. The contract terms will depend on what happens to the economic trend in the spring. Up to then, there's no sign of improvement in unemployment—in fact it's sure to rise through March.

Living costs, while climbing now, may settle down in 1958 but no decline is expected. The unions coming up for bargaining, for the most part, are those who collected deferred increases in 1957. Between productivity hikes and living costs, these averaged about 13¢ an hour. This could be the 1958 floor for bargaining. Certainly, they'll demand more than this, but the way things look now, they may well have to settle for less.

# Forgings on F-100, Save $335 per Part



Special saw removes gates and risers from casting of an F-100 pylon at Rayson Casting & Mfg Co. Tens-50 alloy can later be combined with remelted gates and risers with special re-alloying, in accordance with the specification for the alloy



Less than a 1% x-ray reject rate is being achieved at Rayson even in such complex castings as this one for a Super Sabre pylon



NEWS REPORT

# Missile Output Plans Firm Up

**WASHINGTON—As the Senate Preparedness Subcommittee's missile investigation goes into its final round soon after one month of hearings, the Pentagon's revised missile production plans — post-Sputnik — are beginning to shape up more clearly than ever:**

- Output of the Air Force's Douglas Thor ICBM will now be kept down to the current target of six per month over the next year; it will not rise to capacity production —rated at least 30 per month—as quickly as expected earlier. Still, the missile is being pushed into production well in advance of initial plans. Production schedules for the Army's Chrysler Jupiter IRBM are still unsettled.
- The Air Force's Convair Atlas ICBM development project is being speeded up substantially. Production will be started much earlier and in heavier quantity than initially scheduled.
- Production of the Air Force's Northrop Snark intercontinental, subsonic missile is being cut in half on the expectation that deliveries of the far more advanced Atlas ICBM will be under way in two years.

The impetus for the administration's IRBM-ICBM production step-up comes from the Senate's missile investigation—headed by Senate Majority Leader Lyndon B Johnson—and other political pressures. As recently as two months ago, the Eisenhower administration was claiming that the Ballistic Missile Program was already running on a "crash" basis and could not be profitably accelerated.

The Defense Dept is preparing a supplemental appropriation request for fiscal 1958—reportedly for over $500 million—to get the accelerated IRBM-ICBM production under way as fast as possible. The funds would be used for contracts over the next six months.

In addition, the fiscal 1959 military budget, now on its way to Congress, is expected to include a new appropriation request for missile production roughly double the $2.5 billion already voted for this year.

The Pentagon is apparently having some second thoughts on pushing the Thor IRBM—still not "thoroughly proven" in Defense Secretary McElroy's own words—into full-scale production. Greater volume output will get under way only after some more extensive flight testing and freezing of missile designs.

The Jupiter IRBM Project is "still in a state of flux"—as an official for Chrysler, the prime contractor, puts it. Chrysler says (1) a "good part" of its production tooling for the 175-mile Army Redstone ballistic missile, now in volume production, could be used for manufacture of the bigger Jupiter IRBM; and that (2) additional tooling is needed for "large quantity" Jupiter output.

While production rates for Jupiter are still undetermined, Pentagon reports say Chrysler claims it could tool up to produce five Jupiters a month over the next 18 months—assuming the Defense Dept earmarks sufficient funds.

Major Air Force contractors on the Thor project are Douglas Aircraft (airframe), North American Aviation (engine), General Motor's AC Division (inertial guidance system), and General Electric (nose cone). Bell Telephone Laboratories' project to develop a radio inertial guidance system to back up or eventually replace the GM-AC equipment has reportedly been dropped. All production tooling for Thor is now in place.

Jupiter's major contractors, in addition to Chrysler, are Reynolds Metals (heavy airframe parts), Sperry Rand Corp's Ford Instrument Division (inertial guidance), and Goodyear Aircraft (nose cone).

### Atlas Speedup Slated

The decision to speed up the Atlas Project came even before the missile was successfully fired for the first time on December 17. The speed-up will mean pushing the weapon into "initial operational capability" by 1961, some four years before the original target date. The Defense Dept's guided missile director, William Holaday, describes the speed-up plan as a "hope and a gamble."

In the wake of the speed-up, the number of production workers on the project will be doubled over the next two years and large-scale orders for production tooling, the guidance system, the rocket engine, the nose cone, and other components will be placed well ahead of original schedules.

But an Air Force proposal for a similar speedup on the rival Titan ICBM project is being opposed at the Pentagon's top level right now.

Titan is considered to be a missile with more advanced performance, but it started later than Atlas and lags about a year behind in development. The first test launching attempt is not expected until next summer.

Major contractors on Titan: Martin, airframe; Aerojet-General, rocket engine; AVCO, nose cone; American Bosch Arma, inertial guidance.

Another important policy reversal affecting the Atlas is a new plan to use the missile as a launching vehicle for an earth satellite. Up to now, the military missile and the earth satellite projects have been assiduously separated so that there'd be no "interference" with the military.

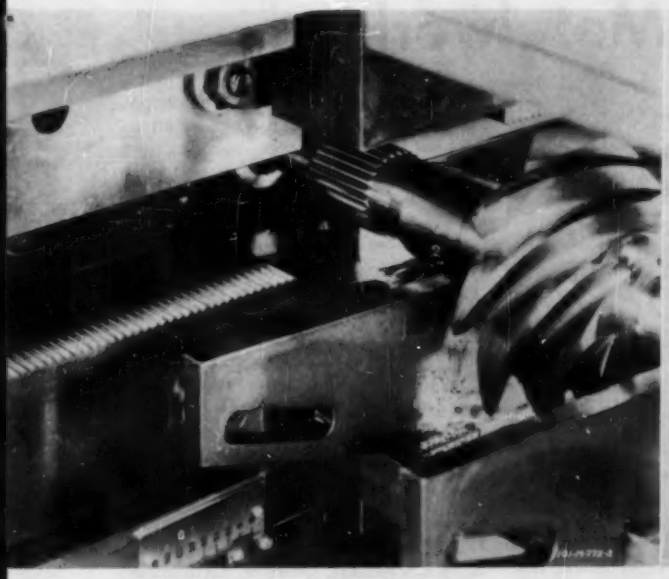
Atlas produces at least 33,000 lbs of rocket thrust — about 10 times the power of the Navy's scientific Vanguard satellite launcher, which up to now has failed to fly. Convair officials say the missile could launch an earth satellite weighing from 500 to a "few thousand" pounds, depending on the altitude sought, six to 12 months from now.

### Politics in the Act

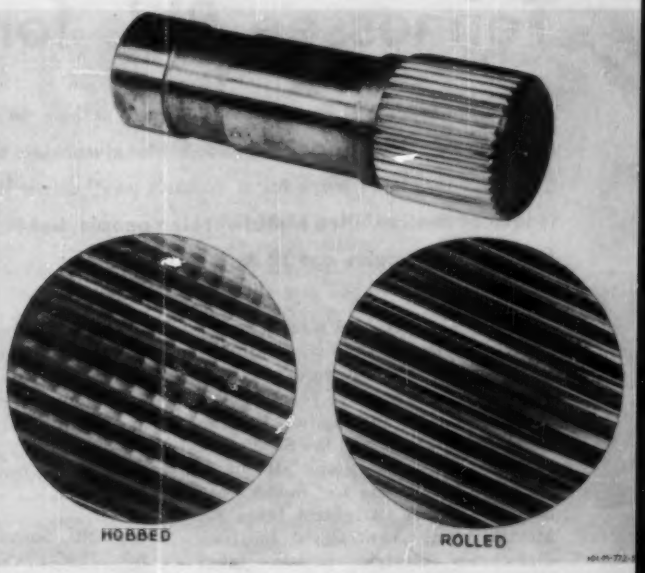
The political tenor of the Johnson hearings, which began as a non-partisan inquiry into the missile program, is becoming more pronounced.

The investigation has brought out more clearly than ever the frenzied efforts, the bitter policy conflicts, and the deficiencies surrounding the missile program. It has also aired in some detail controversial proposals of the individual military services on how to make the transition into the missile-space era:

- Pentagon Missile Director Holaday emerged as something of a scapegoat. Democratic committee members publicly—and some Republican Senators privately—want more centralized control of missile development to speed up decision-making and eliminate costly duplication, are calling for a drastic overhaul of both the Joint Chiefs of Staff setup and military research organization.



**Four regrinds aren't uncommon . . .**
for a Roto-Flo rack (average is three times). If output per grind is 125,000 parts, life capacity per rack is from 369,000 to 492,000 parts




**Surface finish can be held to 3 to 6 mu in . . .**
on rolled splines in regular production. This compares with as much as 250 mu in. for identical hobbed parts

# Chrysler Looks at Spline Rolling

**DETROIT—Now that roll-forming of splined parts has been around for more than three years (*AM*—Jun 21 '54, p180), how is it working out? One answer to this question was given recently by E Ray Morrill in a talk at the Chrysler Institute of Engineering. Based upon his work with the Michigan Tool Roto-Flo process at Chrysler and another auto firm, here are Mr Morrill's observations:**

### 45° PA Better Than 30°

- A 45° pressure angle for spline teeth achieves even greater life than is possible with a 30° angle. Comparative figures on two similar jobs done on Roto-Flo machines: 123,000 splines per rack per grind at 30°; and 375,000 at 45°.
- A rack on the average can be reground at least three times, and four regrinds are common (see photo at left above).
- Surface finish of rolled splines can be held to 3 to 6 mu in. in regular production, compared with 250 mu in. for hobbed parts (see photo at right above).
- In torsion tests, rolled splines have proved 10 to 20% stronger than hobbed splines of the same size. Grain structure rearrangement and prestressing are mainly responsible for this.

### Any Cold-Formed Metal

- Any metal that can be cold-formed can be spline rolled.
- Splines with 45° PA can be formed on annealed stock or on steel up to $R_c$ 35. Tool life is affected by hardness about the same way as that of other tools.
- Splines with 30° PA can be formed on metals up to 207 Brinell.
- Parts may be used "as rolled" or may be heat-treated without adverse effects. Growth in heat-treating is comparable to that in parts produced by hobbing or shaping.

### Roll Right to Shoulders

- Splines can be rolled right up to a shoulder without damaging the face of the shoulder.
- Roto-Flo can roll accurate threads and splines on the same shaft in one operation. Tolerances on finished parts meet American Standards Association standards except for major diameters, which are controlled by the size tolerance of the blank diameter. On Roto Flos, tolerances of as much as 0.003 in. on turned blanks have been found to be permissible.
- When rolling threads on these machines, you can compensate in the rack for subsequent possible heat-treat distortion of the thread—a distortion which generally affects the thread lead primarily.

### 30 Times Usual Rate

- Rolled splines are produced at about 30 times the rate achieved by single-thread hobbing.
- Potential savings can be achieved by using smaller diameter shafts for blanks, as compared to shaft diameters, when splines are to be hobbed.

### Design Changes

- While a part to be spline rolled should be designed from scratch, preferably, for top economy and best results, it is possible to adapt the process to existing parts that have been in production for a long time. But when this is done, the machines and the process must call the modifying shots, rather than changes which originate in product design.

# Tennessee Bids for Metalworking

**Tennessee's central location is a strong selling point in that State's drive to become the South's No. 1 Metalworking center. You get a "dollar's worth of work for a dollar's pay" down there, too. Trouble is lack of really skilled Metalworking people, but the green material is there—all you've got to do is train them**

**MEMPHIS—Once-backward Tennessee (industrially, that is) is undergoing an Industrial Revolution of its own. Until a few short years ago an integral part of the "industrial desert" that characterized the Southeast, Tennessee today is going all out in its drive to become the South's top industrial state. Brightest lures for Metalworking: centralized location, dirt-cheap electric power, labor availability. But the latter has its drawbacks as well as its good points —while there are plenty of Tennesseans around ready and willing to do a day's work for less money than their counterparts in long-industrialized areas, few of them are skilled metalworkers.**

Tennessee today boasts a metalworking industry of wide variety. Some firms have been a part of the industrial picture for a long time, such as Ford Division's Memphis assembly plant, which employs 1600. Many others, however, have moved into the state since the close of World War II. General Electric's plant, now under construction 30 miles from Nashville, will employ 500 in the manufacture of appliance motors and is only one of many new ones.

### Some Old, Some New Plants

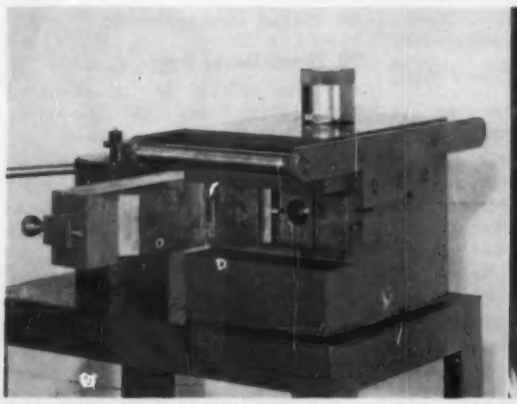
International Harvester Company has been in Memphis since 1947. It employs some 4000 in the manufacture of farm implements. Fruehauf Trailer's Memphis operation, opened the same year, has a workforce of about 400.

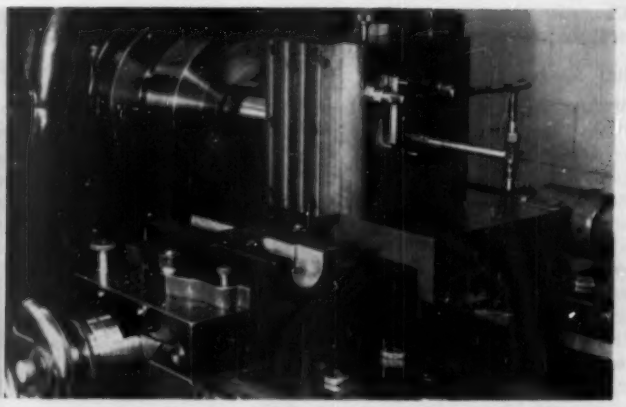
The Wheland Company has been making saw mill machinery and oil-well-drilling equipment in Chattanooga since 1866. Employment is 1800. Combustion Engineering, Inc, now has 4000 working on manufacture of high pressure steam-generating equipment, pulverizing systems and water heaters at its Chattanooga Division. The company has been a part of the Tennessee scene since 1884.

But Tennessee officials are energetically appealing to new industry of all kinds. And their pitch is slanted sharply towards the metalworking industry. Trane Co's $2-million plant under construction at Clarksville and Yale and Towne Mfg Co's new plants at Gallatin and Lenoir City attest to their success. Magnavox's operations at Greeneville and Jefferson City now make Tennessee the world's largest manufacturer of radio, phonograph and high fidelity instruments. Murray Ohio Mfg Co, maker of wheeled toys and electric fans, has moved its entire operation from Cleveland, Ohio, to Lawrenceburg, Tenn. Average employment is 900.

In practically every case, manufacturers cite distribution as an important reason for locating in Tennessee. Leo J Pantas, vice president and general manager of Yale and Towne's Lock and Hardware Division, told the Tennessee Industrial Development Conference that in picking Tennessee for two plants, Yale and Towne gained "the advantage of a complete distribution point." William H. Graham, vice

# ENGLAND: Radioactive Cutting Tools





LONDON—It only takes half a day to test the efficiency of cutting oils—a job that once required three months by the conventional method of making a daily count of units produced by the tool, and the number of regrindings. The secret? Radioactive cutting tool tips. The British firm had the tungsten carbide and cobalt tool tips irradiated in the government reactor at Harwell, kept them in the lead storage chamber at left. Activated cutting tool was then inserted into a totally enclosed cutting chamber on a Swift V8 lathe (second from left). Closeup (third from

president and general manager, Magnavox Co, said "from a shipment standpoint, it (Tennessee's location) is of great advantage to us."

Labor presents both advantages and disadvantages. While the ability, attitude and availability of labor in Tennessee is a great asset, the supply of skilled labor in metalworking is short. State facilities for training are non-existent, and each firm must by and large look to its own training program for skilled labor.

Pantas says that in Tennessee "we get a dollar's worth of work for a dollar's pay." And as for the excellence of the finished product, Pantas points out that all the locks controlling the 42-story Socony Building in New York City, one of the largest air-conditioned office buildings in the world, were made in Gallatin, Tennessee.

At both its Tennessee plants, Yale and Towne maintains apprentice training programs approved by the State and the Veterans Administration. This four-year training program has been standard with Yale and Towne for years, however, and was not initiated on the move to Tennessee.

Lack of skilled labor is also a matter that Milton J Kittler, Holley Carburetor Co executive vice president, has touched on. Kittler has noted that Holley's Paris, Tenn, plant employees "after their initial period of unfamiliarity were able to match very quickly the skill and speed of people employed in our Detroit plant.

"So far as we're concerned, it's the old 'chicken-and-egg story,'" Kittler said. "Which comes first—the metalworking industry or skilled labor in the metalworking field? We have good men in our Tennessee plant, but it took longer to find and get them. We had to shop around a little longer."

Holley has also found transportation a problem at its Tennessee operation. "Because of our connection with the automotive business," Kittler observed, "we are forced to do a great deal of work on an 'emergency' basis. On regular shipments, we get good service. But on unscheduled shipments we often have to race to Nashville or some other point to pick them up."

### Three Metalworking Centers

Decentralization has been the aim of many of the metalworking businesses that have settled in Tennessee. The pattern usually is to find a small community about 30 miles from Nashville, Memphis or Chattanooga. In Yale and Towne's case, company officials actually got a map of Tennessee, and drew a 30-mile circle around Nashville. Then they picked one of the communities falling within the 30-mile radius. In some cases, the advantages of a small community near a metropolitan area have brought with them disadvantages in transportation. This seems, however, to be more the exception than the rule.

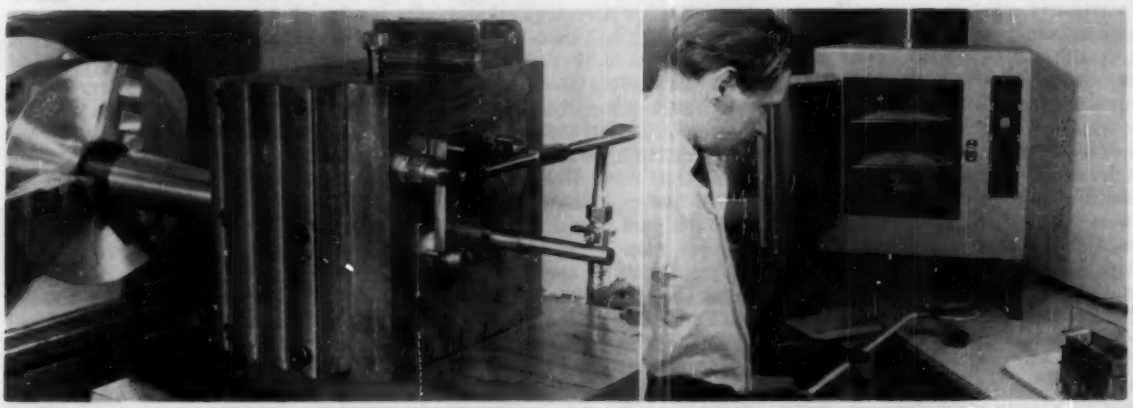
Magnavox began operations in Tennessee following World War II with the purchase of the Greeneville Cabinet Co. In 1950 and 1951, the company moved its radio operations to Greeneville. Magnavox's General Manager Graham says, "We have increased our business 269% since 1955." Magnavox's two Greeneville plants now employ 3100. On February 20, 1957, ground was broken for a 160,000 sq-ft addition to the company's Jefferson City plant. On July 16 the plant was not only built but was equipped with conveyor lines and in operation.

Magnavox, too, has a training program. Graham says that "we can show you facts and figures that show that the productivity of the Southern worker, when properly trained, exceeds that of the Northern worker by 18 to 20%."

In the transportation department, Graham also has some comments. "We are forced to haul, for instance, our metal stampings from as far as Chicago." Magnavox buys over $1 million worth of metal stampings out of Chicago each year. "We could afford to pay a little more for them out of Tennessee," he adds, "so as to save the transportation costs."

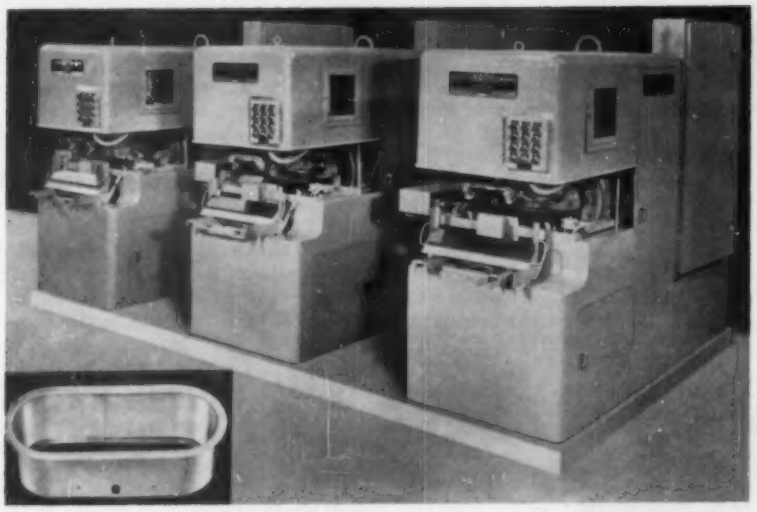
The pattern—with its advantages and disadvantages—is much the same with each individual company, but the consensus is "We are highly pleased with our move here."

# Determine Efficiency of Cutting Oils



left) shows cutting chamber closed, ready for machining operation. Cutting fluid drains into base of the chamber, is collected in a reservoir, then recirculated over workpiece and cutting tool. Technician (right) then washes and dries the metal turnings, records their radioactivity on a scaling unit, and weighs them. Results: quick determination of cutting oil efficiency, and valuable information on cutting tool life and on the quality of cutting tool metal themselves. This development, new to Britain, has been used in this country for several years

# FIELD REPORT



**Form 1500 air ducts an hour . . .**
This high-speed automatic former, built by Cyril Bath, is turning out 1500 air inlet ducts (inset) an hour at Ford Motor Co's Dearborn, Mich, stamping plant. Automatically timed and cycled, machine has three independently powered forming heads. Stacked cross-section blanks are supplied to each head on interchangeable loading hoppers, are then automatically separated and moved to a pre-load station for positioning before insertion into forming dies. Blank is then transferred automatically to forming position, as a previously formed part is ejected. This actuates two forming wings to tangent-wipe the flanged duct to shape. Wings then retract and automatic ejectors unload formed part into a gravity chute, thence to carry-away conveyor

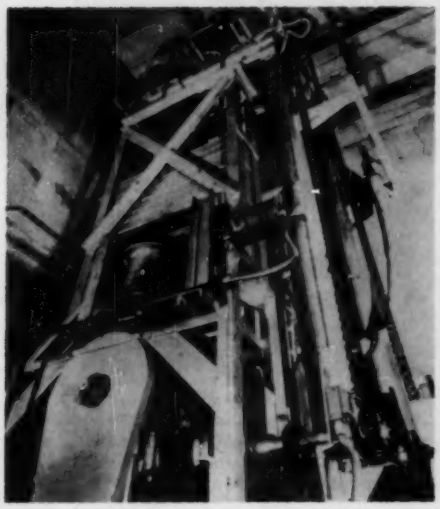
**Gage testing lab for Chicago . . .**
Checking gage blocks to one-millionth of an inch on an electronic machine at Chicago's new precision gage testing laboratory, made available to industry by Size Control Co at 2500 W Washington Blvd. Lab can certify tolerances to 0.000010 in. for plug gages, and 0.000020 in. for ring gages. Entire lab is temperature, moisture and dust-controlled

## Midwest...

**Siegler Corp** of Anaheim, Calif, has decided to give divisional status to its Centralia, Ill, space heating operation; it'll be known as the **Siegler Heating Co.** Firm, which is now engaged primarily in the electronics field, feels that its original Centralia operation can stand on its own feet . . . New research facility for fundamental study of the die casting process is being set up by **Alcoa** at its Chicago works. Lab will be equipped for full-scale pilot plant operations so that studies can be made under production conditions. Active operation is scheduled for January . . . **Wapakoneta** (Ohio) **Machine Co,** longtime maker of machine knives, has bought controlling interest in the **California Grinding Works,** Oakland, Calif, commercial grinder specializing in machine knives, press brake dies, and all types of long, flat grinding . . . **Hotpoint Co** has started to put up the first new appliance factory scheduled in its expansion. Other plants and offices for the 770-acre tract northwest of Chicago are in the planning stages, will be added to meet market needs. First unit, slated for completion next year, will be producing a new type of refrigerator compressor by early '59; initially it'll employ 300-500 people . . . Employment in **International Harvester's** manufacturing and raw material operations went up by more than 1000 during Nov. Payroll pickup followed Oct reduction; Dec figure of 46,484 about equalled Oct 1 . . . Some 1000 employees were laid off during Nov at **Ford Motor's Aircraft Engine Div** in Chicago. Reason: those AF cutbacks. Plant builds J-57 turbojet engines and spare parts. Dec 1 payroll totaled 8719 compared with 12,295 a year ago . . . **Bell & Howell Co,** Chicago maker of motion picture cameras and related equipment, has bought assets of **Inserting & Mailing Machine Co,** Phillipsburg, NJ, as another step in its diversification program. It'll be operated as a subsidiary under the name **Bell & Howell Phillipsburg Co** . . . Production of self-locking threaded fasteners by **Nylok-Detroit Corp** during first five months of the fiscal year starting June 1 just about equaled total production for the previous 12-month period . . . **DoAll Co** in Des Plaines is adding a 40,000-sq-ft research lab and warehouse facility to its plant.

## South...

**Louisville & Nashville RR** plans a $50-million expansion of facilities and operations next year. About $30 million will go for new freight cars —$9 million for the Boyles yard at Birmingham—remainder for other undisclosed operating improvements . . . Merger between **Dresser Industries** of Dallas and **Gardner-Denver Co,** Quincy, Ill, has fallen through. "Differences in concept of management," says Dresser's Chairman H N Mallon . . . **Convair** (Fort Worth) **Div** of **General Dynamics** has a contract for modernization work on an undisclosed number of Air Defense Command F-102As and TF-102A delta-wing jet combat trainers. Dollar amount of the order was not announced . . . New tube division of **Southern Fabricating Co,** Sheffield, Ala, is turning out steel tubing in all commercial sizes and gages, round, square, rectangular, and odd shapes. First shipments have gone out from the company's recently completed 300,000 sq-ft factory area . . . **Texsteam Corp,** Houston, Texas, subsidiary of **Vapor Heating Corp** of Chicago, has purchased assets of



**Biggest vacuum-arc melting furnace?**
Said to be the largest commercially built U S vacuum arc melting furnace, this 38-ft consumable electrode furnace, built by Westinghouse, double-melts zirconium to yield 16-in.-dia ingots weighing upwards of 1 ton. Furnace is in operation at Carborundum Metals Co, Akron, N Y

**Machine tool builders talk defense with Nixon . . .**
Talking over problems connected with the Executive Reserve Plan at a recent meeting in Washington, attended by more than 1000 top executives from vital defense industries, were from left: Arvid O Lundell, advisor to director Metalworking Equipment Division, BDSA, and president Colonial Broach & Machine Co, Detroit; N A (Andy) Olsen, director Metalworking Equipment Division BDSA; Vice President Richard M Nixon; and Wallace E Carroll, president American Gage & Machine Co, Chicago, and chairman Government Relations Committee, National Machine Tool Builders' Association. President Eisenhower and Vice President Nixon, Defense Secretary Neil H McElroy, and many other top government officials attended the meeting

**Graham-Lemunyon Corp,** Los Angeles maker of Graham plug valves used by oil production industry. Inventory of valves, parts, manufacturing fixtures, designs, and patents is being moved to **Texsteam's** recently enlarged plant in Houston . . . New ABC Hardware Div of **Adams Engineering Co,** Miami, has started production of heavy-gage extruded aluminum step-ladders . . . **Northwest Plastics of Carolina, Inc,** newly activated plant in Gastonia, NC, will double capacity to supply demands of the electronics industry . . . Multi-million dollar contract for production of Army's Model H-13H helicopters has gone to **Bell Helicopter Corp.** Order, involving undisclosed number of planes, was placed by the Air Force, which will administer the contract for the Army. Copters will be built at the firm's Hurst plant located between Fort Worth and Dallas . . . **Murray Ohio Manufacturing Co** is installing machines and equipment at its Lawrenceburg, Tenn, plant for manufacture of electric fans . . . Supersonic testing facility has been developed by **Aeronautical Missile Research & Development Inc,** new firm at Winchester, Tenn. **AMRAD** has also developed a portable plastic wind tunnel.

## East...

**Carpenter Steel Co** has plans to invest up to $6.5 million in its new subsidiary, **Carpenter Steel of New England, Inc,** Bridgeport. Acquisition, which doubles Carpenter's overall melting capacity, will be outfitted with additional machinery, including in-process inspection equipment needed to turn out high-grade specialty steels only. Firm will employ around 200 when plant is operating at minimum level; it'll need from 500 to 800 at full capacity . . . Jet-powered French helicopter, the Alouette II, will be assembled at **Republic Aviation's** Farmingdale, LI, plant from French built components. Licensing agreement between **Republic** and **Sud Aviation** of France calls for assembly, marketing, and servicing of the craft initially, to be followed by eventual production of the roto-jets by **Republic** . . . **Carborundum Co,** Niagara Falls, is integrating its **Stupakoff Div** at Latrobe, Penna; **Globar Div** at Niagara Falls and **Refractories Div** at Perth Amboy, NJ, into a single unit named the **Refractories Div.** All personnel, plants, and activities (except the Stupalox sintered oxide cutting tool project formerly at the **Stupakoff Div,** now assigned to the New Products Branch of the **Research & Development Div**) will be combined in the new division . . . **Chase Brass & Copper Co** has sold the entire cold heading department of its **Waterbury Mfg Co Div** to the **Connecticut Screw & Rivet Co** of Waterbury, Conn, and its affiliate company, **Anchor Fastener, Inc,** with plants at Waterbury and Cleveland . . . In addition to annual expansion at the rate of $2 million for the past two years, **Bay State Abrasive Products Co** of Westboro, Mass, has further plans cooking. Among them: an abrasive grain crushing and processing plant in Westboro; new, larger district office in Cleveland; grinding wheel manufacturing plant in Calif; coated abrasive manufacturing plant in Westboro; and a complete grinding wheel manufacturing plant in Italy . . . **General Vacuum Corp,** newly-formed in East Boston, Mass, plans to concentrate on engineering, development, and sales of intermediate sizes of special high-vacuum equipment, as well as development of an improved line of pilot-plant induction and arc melting vacuum furnaces. Arrangements have been made

# FIELD REPORT

with **Artisan Metal Products** of Waltham to fabricate equipment to **General's** design.

## West...

**Lockheed Missile Systems Div** is putting up a $3-million building at Sunnyvale, Calif, that'll serve as a "command post" for work on the Navy's Polaris ballistic missile. Although Polaris work will go on at other **Lockheed** facilities, key functions such as testing, engineering, planning, administration, will be centralized at the new facility, paid for and owned by Navy . . . A $2.5-million AF contract for modification of electronic systems in 131 supersonic F-102A jet interceptors has gone to **Convair Div of General Dynamics Corp.** Order, which will be carried out at **Convair's** production flight facility at Palmdale, Calif, will keep employment there at its present 2500 level through the fall of '58 . . . **Yuba Consolidated Industries,** San Francisco firm with several divisions in the metal fabrication field, has set up a research center at Benicia, Calif, where it'll develop new products and new applications for existing products. Divisions make heat exchangers and heat transfer products, among other things . . . **Hexcel Products, Inc,** Oakland, Calif, producer of structural honeycomb core, has postponed construction of a new plant because of decline in orders during second half of this year—30-35% below expectations because of defense cutbacks. Firm has asked Port of Oakland to put off until mid-1958, at least, construction start on the $1-million facility it will build for lease to **Hexcel** . . . **Sundstrand-Denver,** division of **Sundstrand Machine Tool Co** of Rockford, Ill, will put up a new cryogenics test facility for testing liquid gas accessories used in rocket and missile systems. It also plans to expand operations into further development of hydro-mechanical components used in missiles . . . **Firth Sterling's** new tungsten carbide sintering plant is in operation at Los Angeles. Facility is said to be first of its kind to be installed on the West Coast.

**Machine tool showing for Denver . . .**
Some 600 Rocky Mountain States metalworking executives and operating men were on hand November 21 through 23 at R E Duboc & Associates' open house and tool show in Denver, said to be the first time such a show has ever been held in that city. Demonstrated under power were machines from Black & Webster, Brown & Sharpe, Clearing, Fosdick, LeBlond, New Britain and Lucas. Also displayed were machines from Denison Engineering, Armstrong-Blum, Rockford, Aro, and Govro-Nelson. Pictured here are B N Brockman, vice president R K LeBlond Machine Tool Co (left) and R E Duboc, president of the five-month old distributing firm, demonstrate a LeBlond lathe to two customers

**Dr Erwin G Loewen,** director of machine tool production, Taft-Peirce Manufacturing Co, Woonsocket, RI, has been named, in addition, technical director of the company

**Lloyd Lee** has been appointed director of automation for LeMaire Tool & Manufacturing Co, Dearborn, Mich. Mr Lee held a similar post at Omer E Robbins Co, Detroit

## Micromatic

**Kirke W Connor,** president of Micromatic Hone Co, Detroit, has been elected chairman of the board of directors. Mr Connor founded the organization in 1929

**Clinton E Smith,** assistant to the general sales manager of Pratt & Whitney Co, has been named administrative sales manager, Machinery, Cutting Tool and Gage Divisions

**W J Smetak** (left) has been elected president, treasurer, and general manager of the William K Stamets Co, Pittsburgh, and its subsidiary, the Stamets Export Co. He succeeds the late **William K Stamets** (*AM*—Dec 2 '57, p147). **William K Stamets, Jr,** chief engineer and sales manager of Enterprise Co, Columbiana, Ohio, subsidiary of Stamets, has been elected president and general manager

# NAMES IN THE NEWS...

**Louis W Falk** has been elected executive vice president of the Falk Corp, Milwaukee. Formerly vice president, manufacturing, he succeeds his brother, **Harold F Falk,** recently elected president (*AM*—Dec 2 '57, p147).

**Arthur R Collins** has been appointed a vice president of Stewart-Warner Corp, Chicago. He will continue to serve as general manager of the South Wind Division at Indianapolis, producer of aviation heat exchange equipment and missile cooling systems.

**Stuart W Tisdale** has been named president of Southworth Machine Co, Portland, Maine, manufacturer of precision parts for the aircraft industry. **George F Thurber, Jr,** and **H Theodore Hawkes** have been appointed vice presidents, and **Thomas S Dyer,** production manager.

**Joseph Auslander,** formerly associated with the Aaron Machinery Co, and **Bruno Sonnenberg,** previously connected with Parker Machine Co, have formed the Index Industrial Corp, New York. Company will import and sell, through franchised distributors, a number of machine tool lines including the Wotan high precision boring mill, heavy duty Wotan internal grinders, and the Mondiale "Celtic" precision lathe.

**A C MacDonald** has been named executive vice president, industrial, of A V Roe Canada Limited, and **Stephen G Harwood** has been appointed to succeed him as president and managing director of Canadian Car Co Ltd, a Roe subsidiary. Mr Harwood was formerly vice president of Montreal Locomotive Works, Ltd, an associate of Alco Products Inc.

**Franklin Meyer, Jr,** manager of Taft-Peirce Manufacturing Co's Instrument Gage Division, has been named, in addition, assistant manager of the Small Tool and Gage Div.

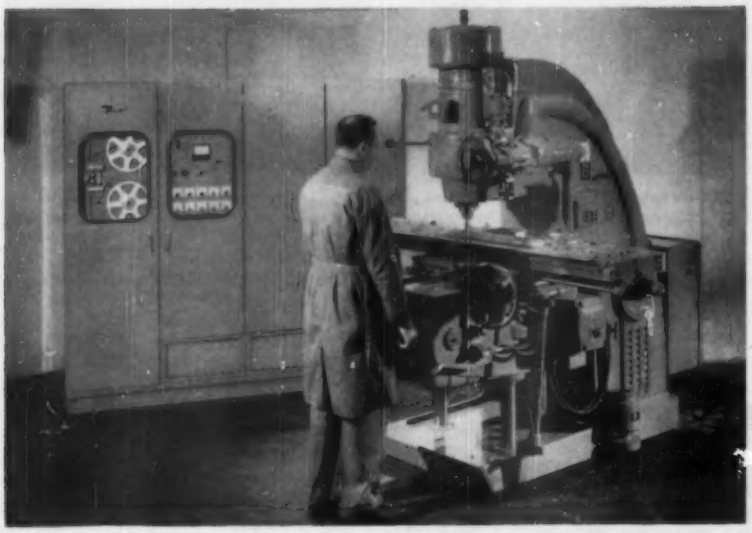
## Hone Names Four to Executive Posts

**Don S Connor,** executive vice president and general manager of Micromatic, and a member of the board of directors, has been elected president and general manager

**William H Harris, Jr,** has been appointed executive vice president to succeed Mr Connor. Mr Harris has been vice president in charge of engineering for the past five years

**William J Pinkerton** has been named administrative vice president of the company. He joined Micromatic in 1942 and has been vice president in charge of manufacturing since 1952

# NEW SHOP EQUIPMENT



## K&T Offers Three Standard Millers With Numerical Control

Three standard knee-type vertical milling machines, Models 2CH, 315TF and 415TF (illustrated), are now available with numerical control. These "KTNC" machines, said to be small versions of the giant AMC horizontal profiler, offer, for the first time, 3-D tape controlled milling for shops that handle small and medium size workpieces.

The purchaser has a choice of control systems—the Bendix system, the GE system or the Digimatic systems made by Electronic Control Systems Inc. As shown in the accompanying table, each of the systems can be combined with any of the machines offered. The selection will be influenced by the nature of the work, computer facilities on hand, and price considerations. Tape preparation, in whole or in part, is available from Kearney & Trecker or from each of the systems' manufacturers.

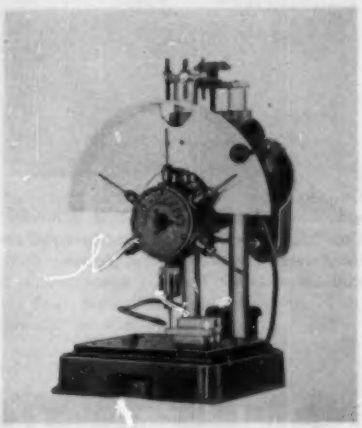
Each of the machines has been re-engineered (not converted) specifically for numerically controlled operation. Preloaded ball screws have replaced the Acme screws for the three motions, and the conventional feed motors and/or gear boxes which control the motions have been replaced by servo motors.

The 5-hp Model 2CH-KTNC has 16 spindle speeds ranging from 25 to 1500 rpm. and a 50 x 12-in. table. The 15-hp model 315TF-KTNC has 24 spindle speeds ranging from 15 to 1500 rpm, and a 72 x 15½-in. table. The 15-hp model 415TF-KTNC (shown here with Bendix control system) has 24 spindle speeds from 15 to 1500 rpm, and a 80 x 15½-in. table. Bulletins available.

*Kearney & Trecker Corp, Milwaukee 14, Wis*

**KTNC System Specifications**

| Machine | | ECS No. 191 | ECS No. 180 | Bendix | GE |
|---|---|---|---|---|---|
| 2CH | Range (in.) | 10x20x4 | 10x20x4 | 10x20x4 | 10x20x4 |
| 315TF | Range (in.) | 14x26x4 | 14x26x4 | 14x26x4 | 14x26x4 |
| 415TF | Range (in.) | 14x34x4 | 14x34x4 | 14x34x4 | 14x34x4 |
| Common to all Models | Accuracy (in.) | ±0.002 | ±0.002 | ±0.001 | ±0.001 |
| | Feed Rate | 6-12 ipm | 0-100 ipm | 0-180 ipm | 0-120 ipm |
| | Rapid Traverse | 15 ipm | 240 ipm | 180 ipm | 240 ipm |



### Burgmaster 3/16-in. Turret Drill Features Automatic Indexing

Bench-model turret drill has been developed to fill a need for a sensitive production machine in the manufacture of small, delicate parts requiring extreme accuracy. Numerous second operations, including drilling, tapping, reaming, counterboring, countersinking and spotfacing can be performed by one operator without moving the workpiece.

Machine is 24 in. high, 17 in. wide, 20 in. deep, has a machined pad measuring 8 x 12 in., and a 16 x 14¼-in. base.

Motor is ¼ horsepower. Two-step timing-belt drive provides speeds in two ranges: high, 650 to 6200 rpm; and low, 350 to 3300 rpm. Accessories include drill chucks; tapping heads; sub-plate, floor cabinet with coolant pump, hose and lamp; and spindle extensions.

*Burgmaster Corp, Div of Burg Tool Mfg Co, Gardena, Calif*

AUTO SELECTOR VALVE, three-port type, permits multiple hydraulic valve operation from single power source. Model AV-1 is engineered for 10,000 psi hydraulic systems; modifications for lower pressure systems are being made —*Manco Mfg Co, Bradley, Ill*

# MATERIALS AND PARTS

## Lapointe Rotary Indexing Machine Takes Loads up to 50,000 lb

New line of rotary indexing machines, known as Rotomatic Positioners, can accommodate loads up to 50,000 lb with no noticeable deflection and no change whatever in indexing action. The load need not be balanced. These universal, automatic machines, available in table diameters of 24, 30, 36, 48, 60, 72, and 84 in. in both horizontal and vertical types, are suitable for heavy drilling, milling, boring and inspection operations. They are also adaptable for programming, tracing, and broaching.

Backlash has reportedly been eliminated. The worm is meshed with the wheel by axially sliding the worm until the backlash of the mesh is absorbed. Another outstanding feature is the indexing accuracy. This is guaranteed by the manufacturer to within 5 sec of arc on the A Series, and within 15 sec of arc on the B Series.

Units provide high speed indexing. A simple change gear system permits varying the index by changing gears. Any number of divisions can be had automatically, from 10 to 2500; and manually, the range is infinite. Indexing can be automatic, semi-automatic or manual as desired. A tape attachment is available.

*Lapointe Machine Tool Co, Hudson, Mass*

### Four-Directional Fork Truck Operates in Narrow Aisles

Designed to handle loads of 14 ft or longer in aisles as narrow as 7 ft, this four-directional truck is capable of traveling forward, backward, to the left and to the right. The new design is available on the company's outrigger base fork models or on its Reach Fork trucks. Capacities range up to 4000 lb on the outrigger trucks and 3000 lb on the Reach models. Lifting features are the same as on former models.

Manufacturer's bulletin available on request.

*Raymond Corp, 47-159 Madison Ave, Greene, NY*

***including...***


**MACHINE TOOLS AND ATTACHMENTS**

Way Grinder ..... 122
Drilling Unit ..... 122
Preselector Lathes ..... 123
Boring Machine ..... 126
Die Filer ..... 126
Surface Grinder ..... 127
Drillpress ..... 134

**TOOLS AND ACCESSORIES**

Carbide Gundrills ..... 125
Cutting Tools ..... 125
Air Drill ..... 126
Dial Index Table ..... 127

**FORMING AND FORGING**

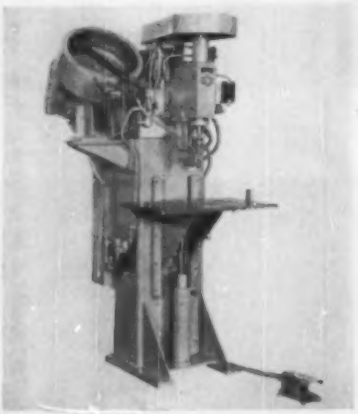
Compacting Presses ..... 125
Flaring Machine ..... 127
Hydraulic Trim Press ..... 128
Mechanical Press ..... 130
Punching Unit ..... 130

**INSPECTION AND LAYOUT**

Granite Riser Blocks ..... 126
V-Block Angle Plate ..... 128
Outside Caliper ..... 128

**PARTS AND MATERIALS**

Die Steel ..... 123
Fasteners ..... 134
Triple Discharge Pump ..... 134

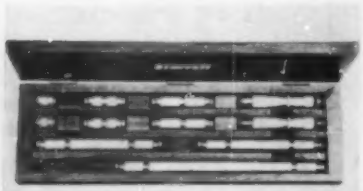


## Heavy-Duty Machine Drives Studs Of up to ⅝ in. Diameter

Heavy-duty stud driving machine, Model STD-1, will drive studs of up to ⅝ in. dia, and will give up to 630-in.-lb of driving torque. Unit also drives Schweppe self-tapping studs and Tap-Lok inserts. Available with either single or multiple spindles, it is equipped with up to 3-hp spindle drive and has air-hydraulic spindle feed.

Drivers are the screw-on or self-opening type. Machine is capable of 1000 cycles per hr. Automatic hopper feed and ease of retooling makes the unit highly flexible.

*Gray Equipment Co. 13600 Ford Rd, Dearborn, Mich*



## End Measuring Rods Give Precise Spacings and Table Settings

No. 244 Series rods, designed for use with jig borers and other machine tools, are available in 1, 2, 3, 4, 5, 6, 7, 8, 10, 12 and 15-in. sizes (also in metric sizes) and may be purchased in standard sets or in any combination of sizes. Also available are two micrometer heads, each of 4 to 5-in. range, graduated to read to 0.0001 in. (or 0.01 mm).

Rods are made of tool steel with satin-chrome finish and ground and lapped contact faces. Each rod has several concentric collars of ⅝ in. dia which serve as bearing surfaces when rod is placed in the groove of a machine tool. Catalog available.

*L S Starrett Co, Athol, Mass*

# Thompson Way Grinder Features Fast, Accurate Vertical Travel

Latest Hydrail surface grinder, with a work area of 48 x 36 x 240 in., has been designed and built for the Landis Tool Co, Waynesboro, Penna, who will use it to grind the ways of their large machine tools.

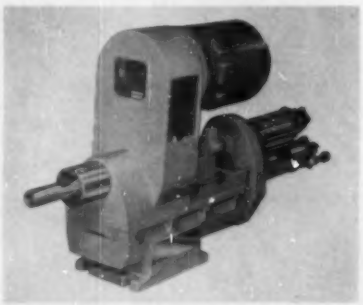
To meet the demand for positive, fast and accurate vertical travel specified by the job requirements, anti-friction recirculating ball nuts are used to reduce friction between nut and screw to a minimum. This also allows the rail to be positioned more accurately, without counterbalancing, and also extends the life of the screw indefinitely. Another new feature is found in the design of the way bearings for the transverse travel of the horizontal and vertical wheel heads. Here, a recirculating roller chain provides greater accuracy and more positive transverse movement.

The machine is also equipped with the company's Hydra-Cool hydraulic system which, by reducing hydraulic heat to a minimum, eliminates heat distortion throughout the machine. Independent operation of the horizontal and vertical wheel heads is another new feature. The horizontal wheel head provides 40 hp, with higher hp available, and uses a 24 x 6 x 12-in. grinding wheel at a speed of 1200 rpm. The vertical head has an inclinable spindle and provides 10 hp and up with a 12 x 3 x 5-in. wheel at either 1800 or 3600 rpm.

Machine can be operated from either side by dual manual controls and a pendant electrical control station. Wheel truing is furnished by a gear-mounted, 90°-included angle device for the horizontal head. Failure of oil pressure to the table ways prevents hydraulic operation of the table. All bed ways and vertical ways have 100% coverage at all times by endless covers and bellows.

Total weight of the machine is 80 tons. It is 13 ft wide and 13 ft high, and has an overall length of 52¾ ft.

*Thompson Grinder Co, Springfield, Ohio*

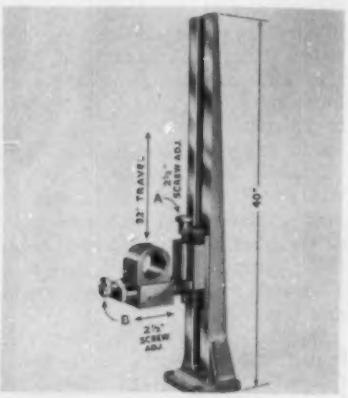


## Automatic Drilling Unit Features Rapid Approach, Feed and Return

Air-hydraulic drilling unit is capable of a complete machining cycle—drill, ream, counterbore, spotface and tap. Tapping can be done by a special tapping head or through a slight modification of the standard unit. Rapid approach, feed and rapid return are infinitely adjustable.

Spindle speeds range from 300 to 3600 rpm. Depth is controlled by a positive adjustable screw stop and microswitch. Standard depth accuracy is 0.003 in.; with a dwell device, 0.001 in. Other specifications include stroke of either 4 or 6 in. max; thrust of five times the line pressure; max line pressure, 150 psi; capacity, ⅛ to 9/16-in. drill in mild steel.

*Gotha, Inc, PO Box 430, Harvey, Ill*

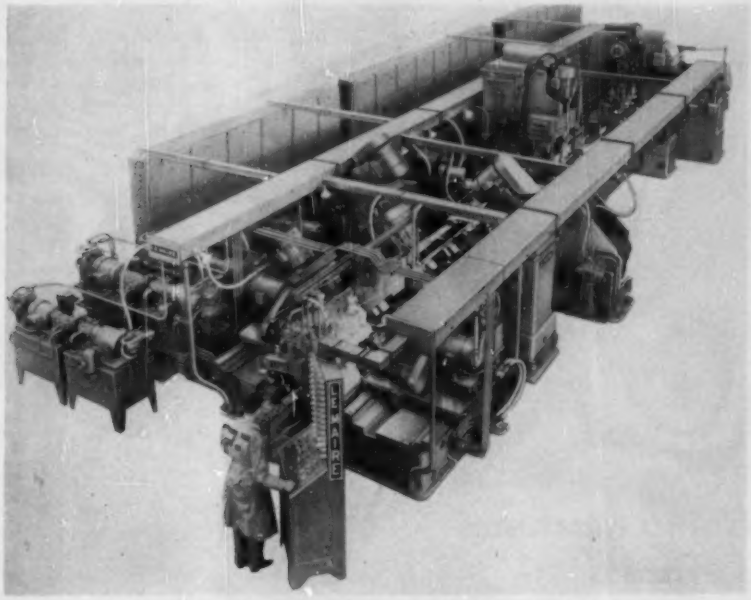



## Tracer Control Introduces New Precision Compound

Compound offering precision holding and locating provisions for spindles and workpieces is specifically designed for wide range of adjustments.

Made of cast aluminum with anodized finish, it is said to be relatively light and easy to handle. Horizontal and vertical dials, screws, and nuts are steel, machine-calibrated in thousandths. Unit can be mounted and used on any surface in any position.

*Tracer Control Co, 593 E Ten Mile Rd, Hazel Park, Mich*



## LeMaire Transfer Machine Processes Three Different Castings

This 25-station line transfer machine is designed to machine V-8 engine intake manifolds at a rate of 65 per hr at 100% efficiency. It can also handle truck engine manifolds for a two-barrel carburetor as well as a four-barrel manifold. Building block construction permits the interchanging of bases, wings or other elements of the machine to accommodate product design changes.

Built for in-line operation, machine features automatic locating and clamping at each work station. Stations include one loading station, three milling, one drill and ream, one turnover, five drilling, one chamfering, one reaming, one chip dumping, one probing, two tapping, one unloading, and seven idling stations.

An automatic lubricating system feeds both grease and oil lubricants to ways and other parts. Electrical and hydraulic systems are in accordance with JIC standards.

*LeMaire Machine Tool Co, 2672 S Telegraph Rd, Dearborn, Mich*

### New Latrobe Steel Is Manufactured Oversize

New flat ground die steel, designated Select B FM oversize ground, is an air hardening steel containing 5% chromium with added sulphide particles said to contribute to machining ease. Both the sulphide additives and carbide particles are uniformly distributed throughout the material by company's "desegatized" manufacturing process.

Because it is manufactured oversize by 0.010 to 0.012, the steel may be ground to nominal dimension after heat treatment. Product is available in sizes from ¼ x 1 in. to 2 x 8 in.; lengths are 18 and 36 in. New packaging includes anti-rust paper around the steel, and a newly designed shipping container strapped around the product to protect it during shipping and handling.

*Latrobe Steel Co, Special Products Division, Latrobe, Penna*

### Speed Preselection Featured On Lodge & Shipley Lathes

Headstock of the new Powershift Preselector Lathe has but a single dial. The inner portion is stationary and is graduated in inches of diameter (of the workpiece or cut). Outer portion is graduated in fpm surface speed. Setting one against the other instantly computes spindle rpm, showing this figure together with maximum safe horsepower. This simple operation preselects the cutting speed. After selection is made, automatic shifting of gears is controlled by operator from his position at the carriage.

Lathes are available in ratings of 1610 (13 in.), 2013 (16 in.) and 2013-17 (20 in.) in engine, toolmaker, gap models and in 45° and 90° Copymatic tracer controlled types. General design features are identical with those of the company's Powerturn series of lathes.

In addition to the preselected speed, operator can set up as many as six additional cutting speeds on the selector dial. Sequentially numbered tabs can be used to mark dial settings for these other speeds. Shifting of gears is accomplished by an electro-hydraulic mechanism. Headstock design is such that electronic programming to provide for any number of speeds can be added. Bulletin available.

*Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio*

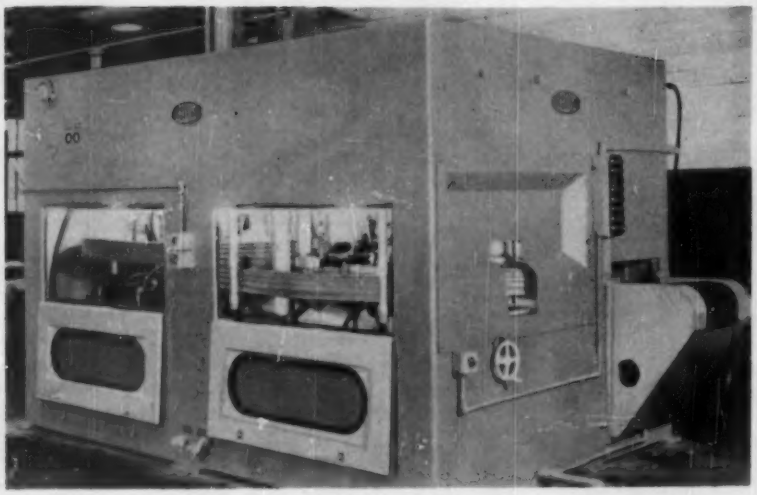
### Sterling Drill Grinders Have Improved Features

New diamond dresser, reported to do a better, faster job of wheel dressing, has been made standard equipment on all Sterling drill grinders.

Additional improvements include incorporation of a shifting lever in Model DA (used in Models DB and DV) to make it easier to change setups for different drill diameters from ⅛ to 2½ in. Micrometer drill feed is now available for all models, and the DB and DV can be obtained with 1-hp motors. Complete information available from manufacturer.

*McDonough Manufacturing Co, Eau Claire, Wis*

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



## Lewis Automatic Finishing Machine Uses Liquid Abrasive Process

Designed to produce microscopically smooth finish on aircraft, missile and automotive components, this automatic finishing machine features an automatic method of handling the parts during processing, and oscillating air-blasting guns which spray a liquid abrasive.

The process can handle different sized parts with ease. Two interlocking sets of moving rubber belts are used. The piece to be finished is grasped between the first set of belts in such a way as to permit most of the surface to be exposed to the high pressure spray from the guns. As the first part of the cycle is completed, the second set of belts picks up the piece on its finished portion and carries it through a second spray area. After blasting operations are completed the pieces pass through a rinse compartment.

The abrasive particles used vary in size from a consistency of a very coarse sand to very finely divided powdery-like particles. A number of different liquids are used as the fluid medium, but water is the most commonly used. The newly designed nozzle provides infinite regulation of the volume and pressure of the air blast with respect to the volume of slurry put into the blast stream. The air nozzle and the water nozzle are mounted in the gun body in such a way that the relative position of the two nozzles can be adjusted, the size of each nozzle can be selected for the type of material to be blasted, the air pressure can be regulated independently of the slurry flow, and the volume of slurry flowing from the water nozzle can be regulated at the slurry pump.

The process is especially suited for the finishing of mechanical parts by the removal of heat treatment scale, rust and other undesirable surface conditions. Tests show that it works satisfactorily on a wide variety of materials including aluminum, copper, mild steel, stainless steel and titanium.

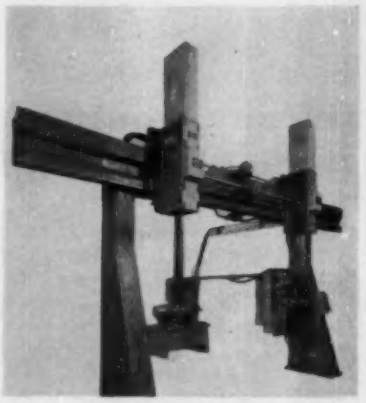
*Lewis Welding & Engineering Corp, Bedford, Ohio*

### Tube-Piercing Machine Pierces Up to 600 Tubes per hr

Machine pierces round and/or irregular shaped holes at production speeds up to 600 tubes per hr. As punch engages the work, tube and mandrel are held in rigid balanced condition by the action of upper and lower compression inserts. There is no distortion of the tube. As many as three heads may be mounted on a single base. Each head can be radially adjusted to 55° either side of center. It is positioned longitudinally by sliding it along keys in the base.

Machine is available in two standard models which pierce tubing up to 3 in. in diameter. Model AA pierces two round or rectangular holes at max over-all distance of 2¾ in., or cuts a slot up to 2¾ in. long. Model AB has a max cutting distance of 4½ in. Standard equipment with both models is the 10-ton-capacity hydraulic power unit, complete with electrical panel. It can operate three heads simultaneousy. Special 17½-ton-capacity units are available.

*Koppy Tool & Die Co, 1530 Farrow Ave, Ferndale 20, Mich*



### Automatic Device Transfers Work To and From Grinders

Automatic loading and unloading device which can be used to automate standard grinders in transferring work to and from each grinder is built in capacities to meet specific requirements. It is a self-contained unit, including its own hydraulic and electrical equipment, and is tied into a grinder by a terminal for synchronized operation.

The unit illustrated is designed to handle two 75-lb automotive crankshafts simultaneously. It straddles the grinder being serviced, with a loading and unloading station at each side. Since it loads and unloads from both sides of the grinder, it can be arranged to service, on an alternate basis, two automatic conveyor lines—one on each side of the grinder. In operation, each loading station lowers to pick up the work, raises and transfers it across and down into the grinding work area. Cycle time is about 15 sec.

*Wickes Corp, Machine Tool Div, Saginaw, Mich*

# FYI

## FOR YOUR INFORMATION

**Use These Reader Service Cards for Your FREE Copies of Catalogs, Booklets, Charts, Calculators**

**To get the ones you need just list number of each booklet described on this and the following pages. When you have filled out card, simply detach and mail. We'll do the rest. Postage is prepaid.**

### MACHINES AND ATTACHMENTS

**1** TWO-POINT, STRAIGHT-SIDE, AUTOMATIC PRESSES—*Niagara Machine & Tool Works, 637 Northland Ave, Buffalo 11, NY.* 24-page illustrated bulletin 264 gives details on all-new Series SA-2 with crankshaft diameters from 4½ to 9 in., capacities from 60 to 300 tons. Features include extra-heavy frame and drive; outsize crankshaft and crankpins; automatic coil feed; and automatic circulating oil system.

**2** BOTTOM DRIVE MECHANICAL PRESSES—*Clearing Machine Corp, 6499 W 65 St, Chicago 38, Ill.* 32-page catalog 235 covers line. Includes specifications of single, double, and triple-action units, as well as description of various types of accelerated slide motions available. Advantages of two-level press rooms possible with bottom drive presses discussed.

**3** POWERSHIFT PRESELECTOR LATHE HEADSTOCK—*Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio.* 6-page bulletin 313 illustrates and describes features and advantages of headstock available on the 1610, 2013, 2013-17 Powerturn engine lathes, and the 45° and 90° Copymatic lathes.

**4** JIG BORING MACHINES—*Triplex Machine Tool Corp, 75 West St, New York, NY.* 16-page bulletin 1256E contains illustrated information and technical data on new Belgian units made by G Matheys of Brussels. Construction details and specifications given for Models SP-30 and 35-NC (said to offer tenths accuracy at low cost) combination jig boring and high precision toolroom milling and boring machines for use where completion of tool or part in single setup is desired.

**5** MILLING MACHINES—*US Burke Machine Tool Division, Brotherton Rd at Pennsylvania RR, Cincinnati 27, Ohio.* 4-page bulletin pictures and describes six different basic mill types for use on wide range of toolroom, job shop, and high production work. Condensed specifications; attachments and adaptations of standard mills illustrate ways in which units can be modified to perform any type of milling operation.

**6** ELECTROLYTIC GRINDING APPLICATIONS—*Anocut Engineering Co, 431 W Washington Blvd, Chicago 6, Ill.* 6-page brochure 115 illustrates latest applications involving process. Three major uses covered: grinding of extremely hard materials, temperature-sensitive materials; and materials that are subject to burrs and layover when ground conventionally.

**7** HIGH-SPEED PRECISION FLEXOPRESSES—*Precision Welder & Flexopress Corp, 3520 Ibsen, Cincinnati, Ohio.* 8-page bulletin AFP-101 gives illustrated information on line. Includes complete specifications on C type from 15 to 75 tons, and on straight side from 75 to 200 tons. Discusses precision ball bearing ram raceways; examples of special tooling.

**8** BENDING EQUIPMENT—*Wallace Supplies Mfg Co, 1300 Diversey Parkway, Chicago 14, Ill.* 36-page spiral-bound booklet presents illustrated information on bending of pipe, tubing, or structural shapes. Shows inplant pictures of three types of bending: rotary, ram, and roll.

### TOOLS AND ACCESSORIES

**9** DRILLS, REAMERS, END MILLS—*Greenfield Tap & Die Corp, Greenfield, Mass.* 96-page catalog 58 is spiral-bound, indexed book containing illustrated and tabular data on carbon steel, cobalt steel, HSS, metric, and special drills; sleeves and sockets; all types of reamers; and multiple-flute, two-flute, and two-lipped end mills. Technical data section covers drill terms; cutting fluids; decimal equivalents; tables on hole sizes for tapping; cutting speeds; plus numerical index.

**10** TOOLHOLDERS — *Vascoloy-Ramet Corp, Waukegan, Ill.* 52-page spiral-bound manual VR-438 gives detailed information on toolholder selection. Separate sections contain tabular data, descriptions, line drawings on 15°, 30°, 45°, lead angle and plunge turning; offset turning; 15° lead angle turning and facing; turning and



Fill in number of each bulletin wanted

Name _____

Title _____

Company _____

Business Address _____

City _____ State _____

(Not good after Feb. 30, 1958)

**BUSINESS REPLY CARD**

No Postage Stamp necessary if mailed in the United States

Postage will be paid by—

Reader Service Department

American Machinist

330 West 42nd Street,

New York 36, N. Y.

12-30-57

First Class Permit No. 64 (Sec. 34.9 P.L.&R.) New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp necessary if mailed in the United States

Postage will be paid by—
Reader Service Department
American Machinist
330 West 42nd Street,
New York 36, N. Y.

First Class Permit No. 64 Sec. 34.9 P.L.&R. New York, N. Y.

12-30-57

Fill in number of each bulletin wanted

Name _____
Title _____
Company _____
Business Address _____
City _____ State _____

(Not good after Feb. 30, 1958)

# FYI INFORMATION

facing with round insert, and facing with triangular insert. Special section covers trouble shooting, carbide grades, multiple tooling, replacement parts, ceramic inserts, table of surface speeds.

**11** OPTICAL AIDS—*Edmund Scientific Co, Barrington, NJ.* 80-page catalog 579 illustrates and describes over 1000 items—components and finished instruments.

**12** ELECTRICAL CONTROLS—*Assembly Products, Inc, 75 Wilson Mills Rd, Chesterland, Ohio.* 12-page bulletin 106 covers simple all-purpose Versatrols, suitable for use with any detectable variable. Applications of most common circuits explained and illustrated, automatic and limit.

**13** BALLIZING — *Industrial Tectonics, Inc, 3686 Jackson Rd, Ann Arbor, Mich.* 16-page technical bulletin and catalog BZQ-11 presents illustrated descriptions of typical applications of process (forcing a ball through a part for hole sizing and/or finishing). Equipment covered includes sizing balls, universal part fixtures, and automatic ballizing machinery capable of sizing holes up to 4500 per hr.

**14** INDEXING TRUNNIONS — *Johnson & Bassett, Inc, 110 Foster St, Worcester, Mass.* 8-page bulletin 1057 describes features of complete line. Illustrated data on speed and convenience of unit in drilling, tapping, and counterboring of typical machine housing. Specifications listed.

**15** QUICK CHANGE HOLDERS — *Erickson Tool Co, 34350 Solon Rd, Solon, Ohio.* 8-page illustrated catalog describes how units can be used on milling machines, boring mills, radial drills, turret lathes. Standard MMS tapered tools can be adapted to these holders.

**16** GAGES—*Rite-O-Tool & Gage Co, 321 West Ten Mile Rd, Hazel Park, Mich.* 16-page catalog and price list covers flush pin gages and dial indicator gage units. New system permits choice of 650,000 standard bar and barrel-type gage variations to be ordered by number. New ⅝-in. adjustment range dial indicator gage unit described and illustrated.

## HEAT TREATING AND WELDING

**17** SEAM WELDING—*Taylor-Winfield Corp, Warren, Ohio.* 16-page bulletin SP-7A contains technical data on seam welding low-carbon and stainless steels from material preparation to weld testing. Includes details on techniques, production speeds, roll spot welding calculations.

**18** WELDING SUPPLIES AND ACCESSORIES—*Air Reduction Sales Co, Div of Air Reduction Co, 150 E 42nd St, New York 17, NY.* 48-page catalog, Form ADC 848B, gives illustrated descriptions of items available for gas and arc welding.

**19** "TRICARB HEAT TREATING METHOD"—*Leeds & Northrup Co, 4907 Stenton Ave, Philadelphia 44, Penna.* 12-page folder T-620(17) gives data on L&N's protected-quench furnace equipment — Microcarb atmosphere control, Speedomax temp control, and a controlled quench. With L&N voltage heaters, equipment can be used interchangeably for controlled case carburizing, carbonitriding, carbon restoration, homogeneous carburizing or hardening.

## PARTS AND MATERIALS

**20** HIGH-TEMP ALLOYS — *Haynes Stellite Co, Div of Union Carbide Corp, 30-30 Thomson Ave, Long Island City 1, NY.* Two 28-page properties booklets describe Haynes alloy No. 25, a wrought cobalt-base material, and Hastelloy alloy X, a nickel-base product available in both wrought and cast form (oxidation resistance at temps to 2200 F). Physical properties, short-time tensile data, stress-rupture and creep data contained in both booklets. Sections describe methods for welding, forming, and machining each.

**21** CAST ALLOYS — *Vascoloy-Ramet Corp, Waukegan, Ill.* 12-page illustrated V-R booklet 573 presents information on Tantung, a cast alloy for cutting tool and wear applications. Comprised principally of cobalt, chromium, tungsten, columbium, and carbon. As a cutting tool it can reportedly be operated at speeds at least 50% (often 100%) higher than those possible with HSS, has higher shock resistance than carbide. Brazing and grinding data, cutting speed range chart.

● "FASTENER FACT FILE"—*Judson L Thomson Manufacturing Co, Waltham 54, Mass.* 42-page illustrated handbook contains complete design and purchasing information on rivets and riveting machines, plus a rivets standards chart. Request direct on company letterhead.

**22** DOUBLE-ENVELOPING WORM GEARS — *Cone-Drive Gears, Div Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich.* 16-page illustrated bulletin 700-C covers line of worm gearing, supplied in individually matched sets, providing high load-carrying capacity on small center distances. Contains specification drawings for all worms and gears, tool charts and hp ratings for hundreds of special gearset combinations, lubrication data.

**23** SILICONES — *Dow Corning Corp, Midland, Mich.* 16-page illustrated 1958 Reference Guide (Code 1-113) describes over 150 commercially available products. Charts, tables, graphs, and data on properties and performance.

**24** BEARING UNITS—*Browning Manufacturing Co, Maysville, Ky.* 11-page catalog BU-101-A illustrates and describes new line consisting of pillow blocks and flange blocks, more compact and lighter weight. Individually packaged in two heights, 28 sizes for ½ to 2-7/16-in. shaft, all with elongated bolt slots.

**25** TOTALLY PROTECTED AC MOTORS—*Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio.* 4-page bulletin B-2506 pictures and describes units from 1 through 125 hp. New NEMA large-frame ac motors and their modifications covered.

**26** ROTORSEALS, QUICK RELEASE VALVES—*Fawick Corp, Fawick Airflex Division, 9919 Clinton Rd, Cleveland 11, Ohio.* 6-page bulletin ML-177 illustrates and describes functions and applications of Rotorseals, used as a means of transmitting air, liquid, or gases under pressure or vaccum from a stationary source into a rotating shaft.



NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

## Metal Powder Compacting Presses Provide More Uniform Part Density

New series of sequence controlled multiple-motion presses, with pressing capacities from 50 to 500 tons, feature two major design innovations that make it easier and quicker to set up the press, and provide a much higher degree of uniformity in part density and greater accuracy in dimensions.

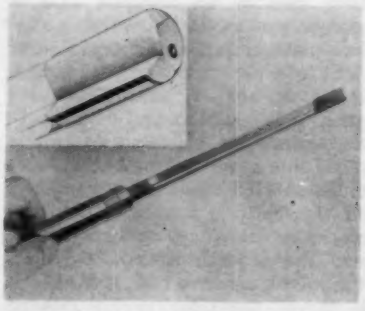
The first innovation is proportional pressing. The two lower compacting punches start their upward compression strokes at different levels and move at different rates but arrive simultaneously at their final, full-compression level. This proportional pressing is accomplished by a potentiometer-controlled hydraulic servomechanism which senses the movements of the platens which carry the two lower punches, and makes them follow a predetermined relative-movement pattern. This results in more uniform density.

The second innovation is motor-driven adjustment of the mechanical stops which control the depth of fill and length of the compression strokes for both the upper and lower punches, and for the ejection strokes of the lower punches. These adjustments are made on a pushbutton panel; position of each stop can be read directly to 0.0001 in.

Model 713 300-ton press (illustrated) has an overall height of 17 ft 8 in. and is capable of making parts up to 12 in. in diameter. It operates at a maximum of four cycles per min at the full fill of 8 in. At a 1-in. fill, it operates at maximum of 10 cycles per min.

Other press features include sequence controlled press motions, simultaneous ejection, self-contained hydraulic power unit, and open-top box type feed which covers the entire area of a piece of max diameter. All controls are at die-table level; a selector switch provides a choice of manual operation, single-stroke, or continuous automatic operation.

*F J Stokes Corp, 5500 Tabor Rd, Philadelphia 20, Penna*



## Single-Flute Carbide Gundrills Permit High Feed Rates

Single-flute carbide gundrills for drilling precision holes from the solid in a single operation are designed for operation on machine tools equipped with pressurized coolant systems in conjunction with a drill bushing. Pressurized coolant passes through tubular steel body to cutting edge.

Drills are equally effective on ferrous and nonferrous parts. They are made in two designs. For hole diameters up to 13/16 in., a solid-carbide tip design is used. Drills for holes above this size and up to 1½-in. dia are provided with an insert carbide tip design having one carbide cutting tip insert and two carbide wear strip inserts.

Shanks are available either straight or tapered; lengths, to customer specifications.

*Star Cutter Co, 34500 Grand River Ave, Farmington, Mich*

## Cutting Tools Improve Finish, Reduce Machining Costs

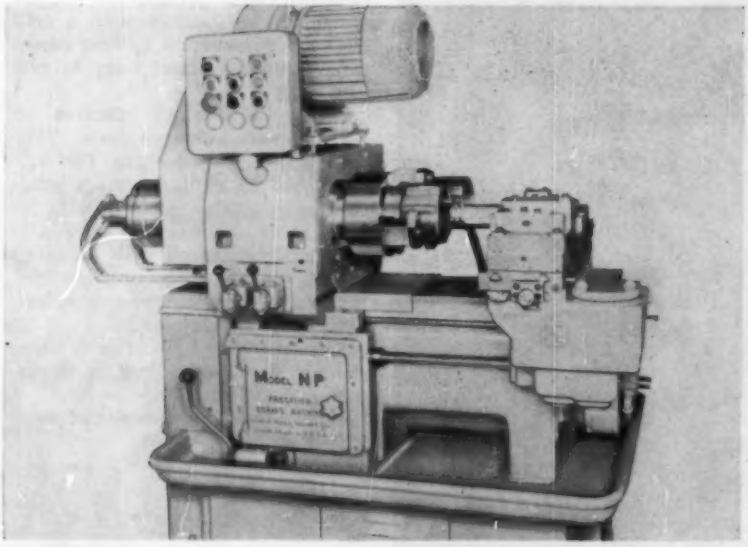
Based on the clutch-drive principle, these tools feature a "taper-torque" drive which is reported to provide greater load carrying capacity than former drives. The taper design of the shank assures accurate positioning and alignment of the tool in the matching holder without exerting any driving force on it. All power is transmitted through the on-center drive lugs. These lugs are said to provide a more equal distribution of the radial driving force between holder and tool.

Increased rigidity is responsible for reduced tool chatter, and helps to prevent contact shock from backlash or slack. Tools and holders are made to order for special tooling. Five sizes of holders will accommodate cutters from ¾ through 3⅜-in. OD. They are available in any grade of high speed tool steel and can be tipped with carbide. A cam-type drift tool is provided for tool removal.

*Metal Cutting Tools, Inc, 301 S Water St, Rockford, Ill*



NEW SHOP EQUIPMENT, MATERIALS, AND PARTS




## Boring Machine is Available With Low, Medium or High Speed Spindle

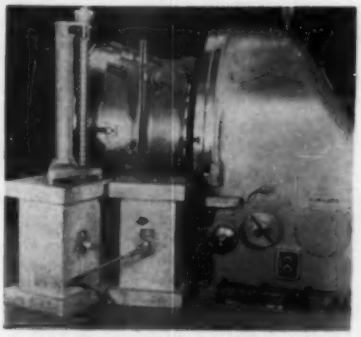
Model NP precision boring machine is available with either one or more precision spindles mounted independently on a fixed bridge. The spindles may be driven by separate motors when different spindle speeds are required, or by a single motor with tandem drive. Three different types of spindles are available—a low speed spindle for speeds up to 2500 rpm, a medium speed spindle for speeds up to 5000 rpm, and a high speed spindle for speeds up to 10,000 rpm.

Longitudinal movements are obtained by a drum cam which reportedly assures a positive feed and a far better work finish than any other type of feed. The company's Quick Changeover Mechanism permits variations in length of carriage stroke, rapid traverse and feed cycle without changing or adding cams.

Parts may be rotated in fixtures on the boring spindles with the tools mounted on the table, or if it is impossible to rotate the part, it can be held in a fixture on the table and the tools rotated.

Specifications include 16-in. swing over table, 5-in. longitudinal table stroke, 9⅝ x 19-in. table, 19½-in.-wide headstock bridge. Boring feeds range from 0.0005 to 0.054 ipr. The front cross-slide has a cross travel of 1¼ in., cross adjustment of 1 in., and is 7 in. wide. Rapid traverse rate is 370 ipm. Approximate floor space required is 35 x 49 in.

*Seneca Falls Machine Co, Seneca Falls, NY*



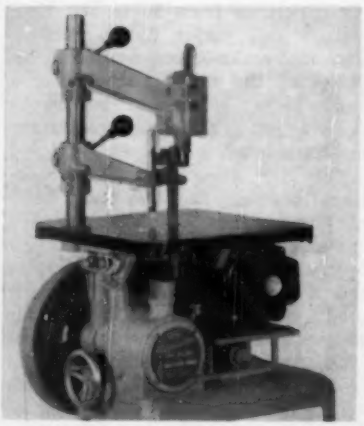
### Granite Riser Blocks Increase Range of Standard Height Gages

New granite riser blocks facilitate height gage readings on parts with higher-than-normal check points. They provide an accurate granite surface parallel to the working surface plate and at an elevation sufficient to allow use of standard height gages. A unique "air-lift" feature permits fingertip control of the 300-lb blocks. Air, at about 40 psi, is piped into a hole in the back of the block and led to a series of grooves on the bottom surface. Thus, the blocks actually float on a cushion of air. The grooves are cut to within 2 in. of the edges so that, if the block is moved too close to the side of the surface plate, the air escapes and the weight of the block prevents it from being moved any nearer to the edge. Air is shut off when block is positioned.

Blocks are 24 in. high and 14 in. square on top and bottom. Top and bottom surfaces are flat to a max reading of 0.000050 in. and parallel within 0.000075 in. Other sizes and shapes available.

*Herman Stone Co, 1860 N. Gettysburg Ave, Dayton, Ohio*

AIR DRILL, ¼-in. size, is available in speeds of 2500 and 4000 rpm. This Series 1P tool weighs 30 oz and is only 6½ in. long. The 5-blade rotor construction is said to offer low air consumption. Other features include offset throttle handle, upper and lower rotor ball bearings, and wire-brushed aluminum finish—*Thor Power Tool Co, Prudential Plaza, Chicago 1, Ill*



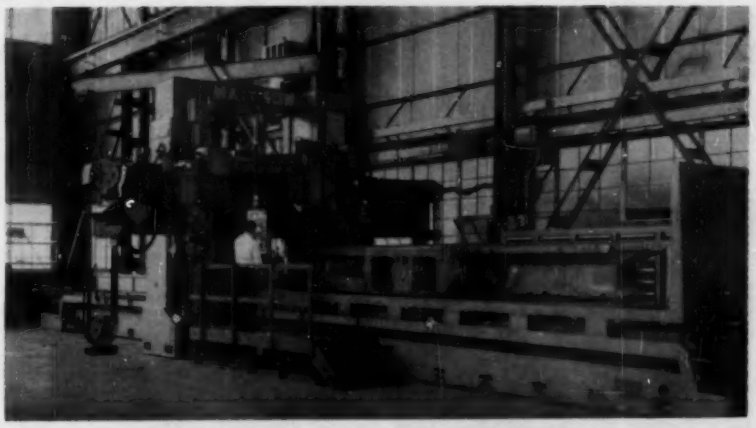
### Die Filer Has Infinitely Adjustable Speed and Stroke Lengths

The new Milwaukee Die Filer, Model FS-VSS, features infinitely adjustable speed and stroke lengths. Speeds from 100 to 475 spm and stroke lengths from 0 to 2 in. are available. Other features of this low-cost, bench-type machine include offset upper and lower chucks of ball-jointed construction; improved swinging overarms; choice of three sizes of 4-way tilting tables; and a rapid zeroing adjustment for the tables. Bulletins available.

*Rice Pump & Machine Co, Belgium, Wis*



NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



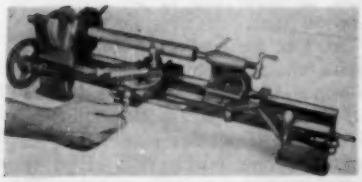
## Mattison Plano Surface Grinder Available With Two Work Spindles

This new grinder has two work spindles and is capable of grinding work up to 80 in. wide. Both heads are controlled by operator from single pendant. An interlock system provides maximum safety in preventing machine and work damage by accidental depressing of a wrong control button. Table always starts in forward position so that operator always knows direction of movement.

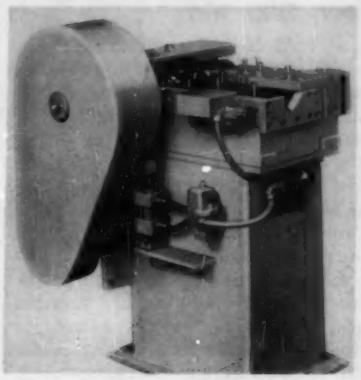
Among controls at pendant are cross-travel of both spindle heads, table speed, feed rate, raising and lowering, table inching, and stop and start of table reciprocation.

Vertical head swivels up to 50° each way, permitting the grinding of V-ways, dovetails, shoulders, edges, contours, and radii all in a single setup. Horizontal spindle takes up to a 22-in.-dia by 6-in.-face wheel; vertical spindle takes up to a 20-in.-dia segmental wheel. Base is 57 ft 8 in. long; table top is 60 in. wide by 24 ft long.

*Mattison Machine Works, Rockford, Ill*



BENCH ENGINE LATHE, called Little Giant, for work on metal, wood, or plastics, has bed length of 30 in., cutting range of 20 in., swing of 7 in. Unit, equipped with three-speed pulley, operates at 1750 rpm at ¼ hp—*King Corp, 3157 Euclid Ave, Cleveland 15, Ohio*



### Machine Produces Double Flare On Steel or Nonferrous Tubing

Machine consists of two basic, integrated mechanisms: a motor-driven mechanical press, and a mechanical punch-shifting and tube-clamping mechanism. The machine is designed to produce a double flare at high speeds on steel and nonferrous tubing, at a single tube position. Reportedly, the mechanical flare-punching operation is more accurate and less variable in penetration at high operating speeds than either a hydraulic or pneumatic punching operation.

Tube capacity is ½-in. OD x 0.035-in. steel tubing and up to ⅝-in. OD for copper, brass, or aluminum tubing. Operating speed is 180 spm (two strokes per flare) or 90 flares per minute at 100% efficiency.

When clutch is engaged, the tubing is gripped by two steel dies. There are two punches. The bulging punch first strikes the end of the tubing; then the punches automatically retract and shift position laterally. Next, the flaring punch strikes the end of the tubing. The two dies then re-open, completing the cycle, and the clutch is disengaged by the anti-repeat mechanism.

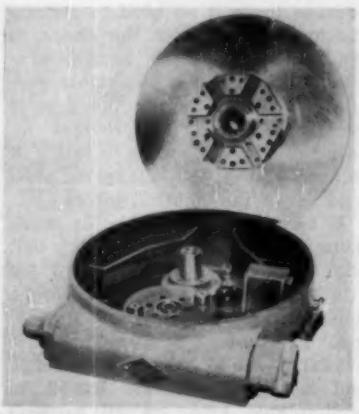
Model A-2 features a foot-operated clutch, and has a mechanical anti-repeat mechanism. Model B-2 has an air-cylinder-operated clutch and an electrical anti-repeat mechanism.

*Automation Associates, Inc, 1444 East 11 Mile Rd, Madison Heights, Mich*

### Portable, Air-Powered Nibbler Cuts ⅛-in. Mild Steel

Portable nibbler cuts ⅛-in. mild steel and ¼-in. thicknesses of softer materials like plastics. This air-powered tool eats through material at a speed of 5 to 6 fpm, making a clean, sharp cut, free from distortion on both sides. Right or left-hand rams are available for special work on curved and corrugated surfaces. Punch is replaceable; die can be resharpened when necessary.

*Buckeye Tools Corp, 5023 Springboro Pike, Dayton 39, Ohio*



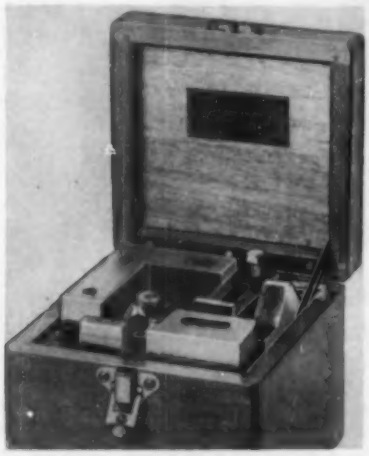
### Dial Index Table Automates High-Volume Machining Operations

The Gem-26 dial index table will index a weight up to 2000 lb and may be equipped with as many as 12 stations. This 26-in.-dia table will

automate drilling, tapping, riveting, spinning, staking, knurling, chamfering, welding and screwdriving machines, gaging devices and other high-volume operations.

Unit will index to ± 0.001 in. on a 24-in.-dia work circle, with true Geneva motion. Rotary air motor, solenoid valve, and limit switch are standard equipment; electric and hydraulic motors are also available.

*Gray Equipment Co, 13600 Ford Rd, Dearborn, Mich*



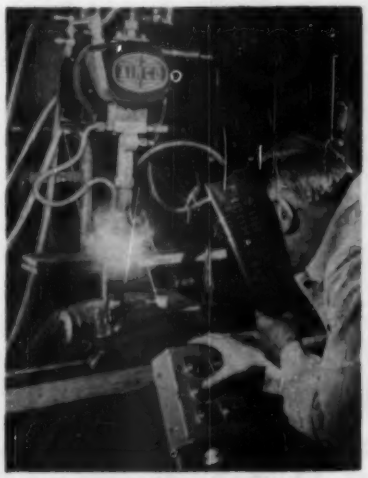
## V-Block Angle Plate Reduces Setup Time to Seconds

V-block angle plate, designated Master, features a side gage, which may be attached to either side, that automatically positions the work without the aid of surface plates or squares. Wear on the surface grinder chuck and on the angle plate is reduced because there is no need to remove the angle plate from the chuck to the surface plate for setups. Another feature is the adjustable parallel which attaches to the side of the angle plate. It provides an adjustable-height work shelf. A stepped clamp with elongated slots holds even the smallest pieces.

A 1-in.-long V-notch holds work from ⅛ to 2¼-in. dia; a T-slot, bolt and knurled nut are provided for attaching a sine bar; two ½-in.-dia holes provide for attaching unit to machine table. Two models are available—No. 8 has a ground finish and is accurate within 0.0002 in. accumulated error on all surfaces and over a 4-in. distance; No. 8-L has a lapped finish and is accurate to 0.0001 in.

Unit comes in wooden case and is complete with all accessories, including a 5-in. sine bar.

*Lassy Tool Co, Plainville, Conn*

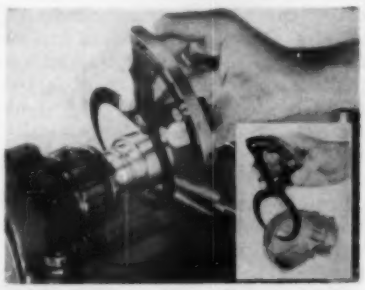


## Automatic Welding Head Feeds Heavy Filler Wires

Model AMH-C Aircomatic machine head is specifically designed for heavier, production applications of automatic machine welding. Aluminum wires of from 3/64 to ⅛ in., and hard wires from 0.045 to ⅛ in. can be fed at any rate up to 600 ipm. Wire feed speed is fully adjustable. Unit is rated at 600 amps, on a 100% duty cycle.

Head can be rotated through 360° for work in virtually any position, and a portable remote control station provides a convenient means for controlling the operation.

*Air Reduction Sales Co, Div of Air Reduction Co, Inc, 150 E 42nd St, New York 17, NY*



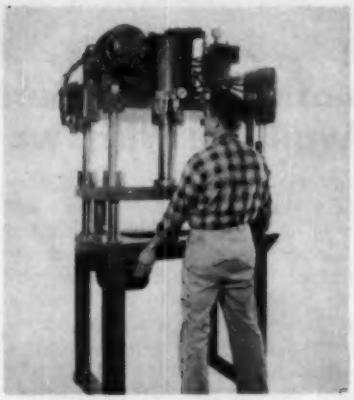
## Direct-Reading Outside Caliper Has 4-in. Capacity

Model 1404 outside caliper measures bar stock, sheet stock and lathe turnings up to 4 in. thick. It is also useful in measuring castings and moldings of irregular shape.

Squeezing the handle opens the caliper; a spring closes it on the work. Size is read directly on a 0- to 4-in., black-on-white scale that is calibrated in 32nds. Long, curved legs reach over flanges and other obstructions to measure sections up to three inches from the edge of a part. Narrow tips will fit into grooves and slots only 1/16 in. wide. Thumbscrew locks caliper at any setting.

A companion inside caliper is also available. Price, for either tool, is $1.95 through suppliers or $2.00 postpaid.

*Master Specialty Co, Inc, 3725 Monitor Ave, Minneapolis 26, Minn*



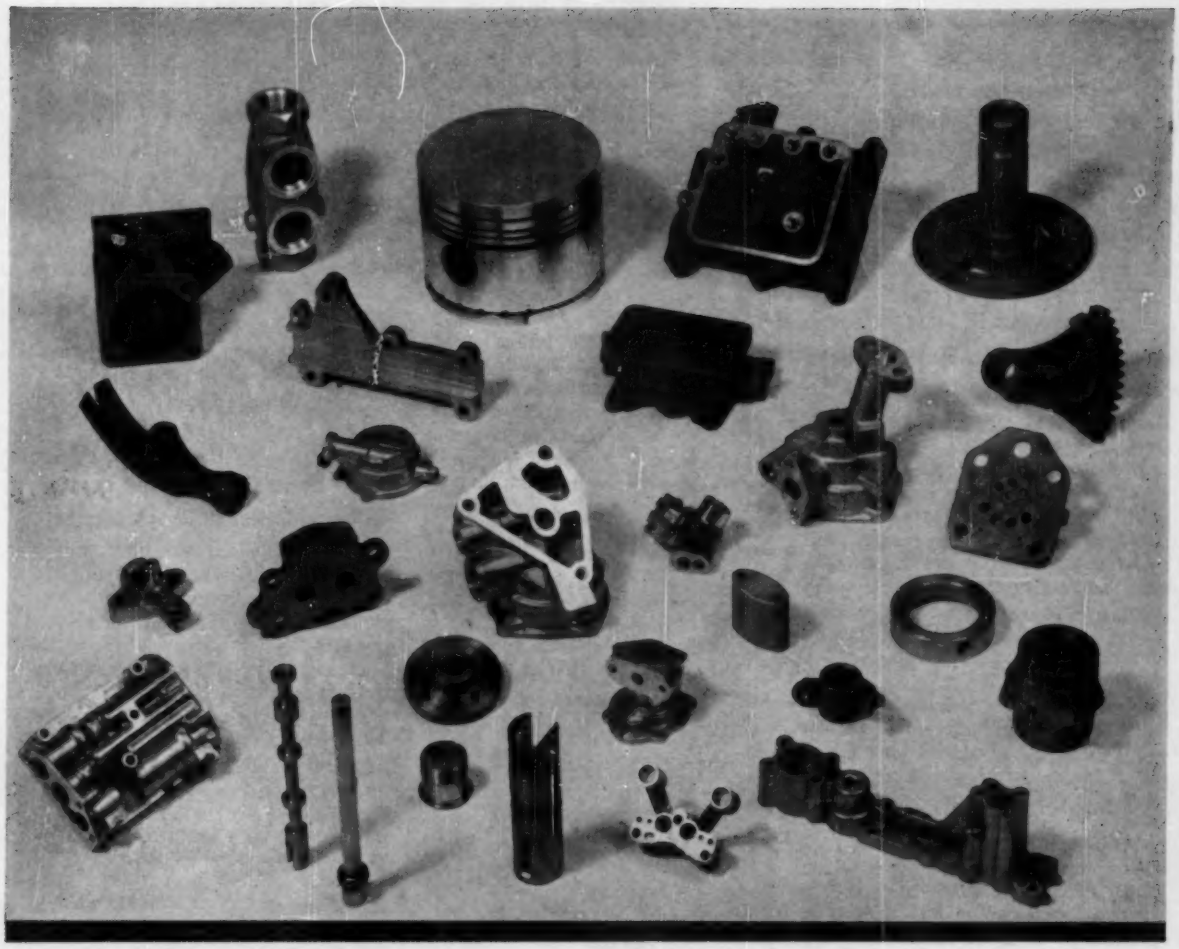
## Hydraulic Trim Presses Feature Rapid Cycling Action

New series of heavy-duty, fast-acting, high-velocity, hydraulic trim presses is designed around a new principle using an accumulator with a closed, shock-free, pressurized, hydraulic system. Extremely rapid cycling action is achieved with lower horsepower input. Approach speeds up to 2000 ipm ram travel provide broader production capacities in die casting, metalworking, plastics, and ceramics industries.

Presses are available in platen sizes of 15 x 18 in. up to 36 x 54 in., offering 12, 15 and 18-in. strokes, with shut heights of 5, 10 and 15 in. Both 2- and 4-post types are available in capacities of 13, 20, 30, 40 and 50 tons.

An electrical selector control provides choice of manual, semi-automatic and set-up cycling. On manual, release of one pushbutton stops the press; on semi-automatic, the release of one pushbutton stops the approach or return; on set-up, the platen can be floated, or minutely inched up or down. Typical operations include swaging, stamping, shearing, blanking, trimming, forming and drawing.

*Buffalo Metal Container Corp, Bausenbach Hydraulics Div, 75 Meadow Rd, Buffalo 16, NY*



# Parts made by almost every industry have holes made by a KINGSBURY

From the carburetor body to the lock cylinder . . . the bearing race to the hammer head . . . would just be a variety of parts — except for one important advantage in common:

*the drilling and tapping operations were completed faster, at lower cost per operation, with unvarying accuracy — in every single part — because an automatic Kingsbury machine did them.*

This can mean a distinct manufacturing advantage to *you*, if you have high production drilling, tapping, reaming, spot facing, light milling and similar operations to do on your parts. You can do them at the *rates you need*, at the *lowest practical cost, month in and month out*, on a Kingsbury indexing automatic.

"Kingsbury jobs" — as the automotive and appliance industries frequently call them — are typically done in this manner: The manufacturer sends Kingsbury a print (or sample) of his part, specifying operations and the production rate required. Kingsbury then incorporates the appropriate standard operating units, base, indexing unit and drive, to build an automatic drilling and tapping machine *to do what the customer wants, at the rate he wants.* Test runs by Kingsbury *before* shipment, and *delivery of a fully tooled machine* ready to produce, provide positive assurance that performance will match production requirements.

Whether you make automotive, plumbing, hardware, machine, electrical appliance or some other kind of parts, investigate the production and cost benefits in doing the drilling and tapping on a Kingsbury. Send your requirements and questions to Kingsbury Machine Tool Corporation, Keene, N. H.

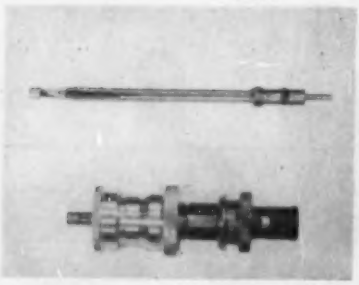
KINGSBURY

INDEXING AUTOMATICS
for high production drilling and tapping



IN BUSINESS MACHINES, TOO,

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



## Lapping Tool and Adjustable Head Speed Small Hole Lapping

Lapping tool (top) called Marvelap is said to respond to very fine size adjustment. Cutting speed is very fast, greatly reducing lapping time. Half shells are made of heavy-gage hard brass, accurately formed and coined to size. They are designed to produce the proper expansion in conjunction with the center wedge. Sizes range from ⅛ to ¼ in. by 32nds. Prices range from 75¢ to $1.05.

The adjustable head (bottom) provides positive adjustment of torque and diameter of lap. Diameter of lap may be adjusted without stopping the drillpress or other driving unit. Price is $87.50.

Also available is the Speed Lap, featuring interlocking prongs which hold expansion even for lapping straight round holes. It is locked in position at all times but is easily adjusted by simple turn of the adjusting nut. Sizes range from ¼ to ½ in. by 16ths. Prices range from $1.90 to $2.90.

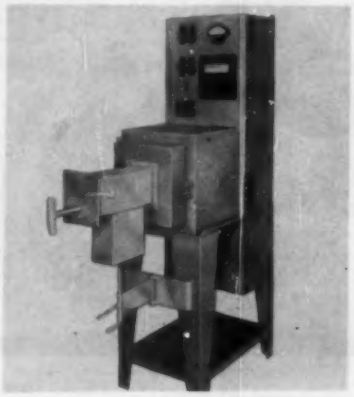
*Perfectole Industries, Riverdale Station, Box 86, Dayton 5, Ohio*

## Self-Aligned Punching Unit Pierces ⅛-in.-Thick Mild Steel

Designed for use in press brakes, punchpresses and arbor presses, this self-aligned punching unit is capable of piercing 0.093 to 0.3115-in.-dia holes in mild steel up to ⅛ in. thick. It will also pierce other materials such as plastics and fiber. It is available with either a 6¼- or 7½-in. shut height and has a 3½-in. die height. The disk stripper spring arrangement is guaranteed against breakage and provides high initial stripping pressures.

Other features of the ¾-in.-wide tool include a pedestal-type die to accommodate angle or extrusion piercing; adjustable punch heads which allow punch to be adjusted to proper length after sharpening; back gage work stops for gaging hole distance from edge of sheet. The company's 3-point guiding feature is said to provide long punch and die life.

*Toolset, Inc, 1411 Military Rd, Buffalo 17, NY*



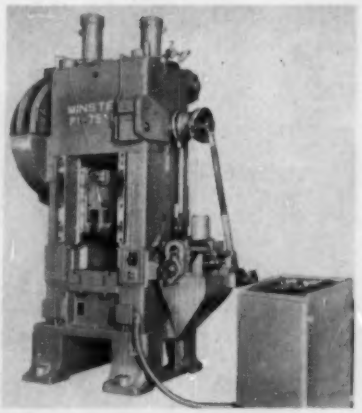
## Controlled Atmosphere Electric Furnace Available in Six Models

New line of controlled atmosphere electric furnaces, designated Atmo-Carb, is designed for heat-treating of steel. Temperature range is 2000 F. The furnaces are complete with Inconel muffle and a fully equipped atmosphere generator. Standard MHE series has a shuttle muffle with a loading elevator; MHD series has a direct loading muffle with a vertical counterbalanced door and features a flame seal.

Unit is also useful for clean hardening, carburizing, and preventing decarburization of straight- or chrome-nickel steels. It can also be used for case hardening low carbon steels.

Firing chamber sizes available are 4½ in. wide x 5½ in. high x 8 in. deep, 8 in. wide x 6 in. deep x 14 in. high, and 8 in. wide x 6 in. high x 18 in. deep. Special size units are also available. Literature available.

*L & L Mfg Co, 136 8th St, Upland, Delaware County, Penna*

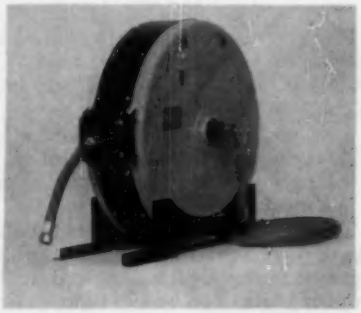


## Single-Point Straight-Side Press Withstands Heavy Shock Loading

Model P-1 Piece-Maker press, available in capacities of 75, 100 and 150 tons, is designed for automatic operation and is reported to be especially suited for progressive die blanking and perforating operations that involve heavy shock load.

All wear points, main bearings, eccentrics, lower connections and ways are nickel-bronze lined. An air-friction clutch and brake provides fast action at any speed with quick, controlled stopping. Fixed or variable speed drive is available. The recirculating lubrication system provides a constant, controlled flow of oil to all bearing surfaces. Presses are of the vertical type but all sizes can be furnished permanently inclined to 27½° for efficient gravity part drop-out.

*Minster Machine Co, Minster, Ohio*



**INDUSTRIAL HOSE REEL, Model A-2, has a capacity of 50 ft of ½-in.-ID single hose. Designed for use with compressed air, industrial gases and liquids, unit has universal-type mounting bracket. Clock-type spring provides automatic retraction into metal housing when hose is not in use—** *United Specialties, Inc, Main and Mosby Sts, El Dorado, Ark*

IN BUSINESS MACHINES, TOO,

# Sharonsteel Quality STANDS OUT

• These machines are encased in Sharonart*—the popular rolled-in surface pattern steel. Sharonart* is one of many steels developed by Sharon engineers during the past half century to help the Business Machine Industry make products look better, work more efficiently and last longer.

*To change the style—change the steel to Sharonart* Literature and sample kits upon request. **Sharonart*** is a trademark of the Sharon Steel Corporation.

SHARONSTEEL

*For 56 Years a Quality Name in Steel*

244

SHARON STEEL CORPORATION, SHARON, PENNA.

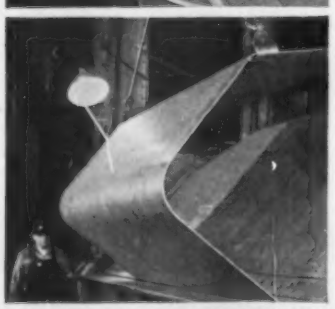
CHICAGO, CINCINNATI, CLEVELAND, DAYTON, DETROIT, GRAND RAPIDS, INDIANAPOLIS, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, ROCHESTER, SAN FRANCISCO, SHARON, SEATTLE, MONTREAL, TORONTO

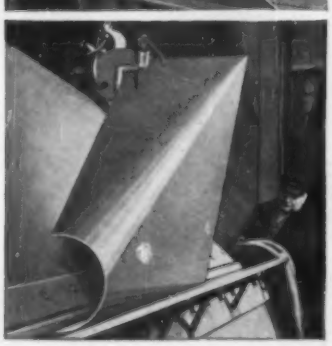
# Bending Steel Plates for WELDMENTS?

## do it economically with

# CHICAGO® POWER BENDING BRAKE

*(no dies needed)*

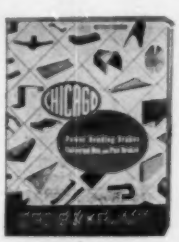




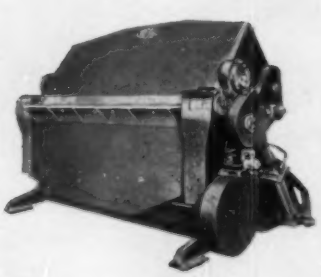
The accompanying illustrations give an idea of the versatility of the CHICAGO bending brake. No dies have to be changed or adjusted—no dies are used on these jobs. Yet, duplication is easily obtained on successive pieces. The machine is quickly adjustable for different thicknesses of material up to rated capacity. Automatic stop regulates the angle of bend. This, too, is adjustable to any degree of bend. The ease of changing from one job to another and the elimination of die costs make the CHICAGO bending brake the economical method for bending steel plates for weldments.

Many standard sizes are available with capacities for bending mild steel up to 12 feet by ¾ inch or 16 feet by ½ inch. Also many standard sizes in hand and power operated models for sheet-metal.

**BULLETIN P-55**
This bulletin gives the details of how these and many other jobs are handled. Also complete description of the machine and specifications of the standard sizes.
Ask for a copy.




Front view of one of the heavy duty models of CHICAGO power bending brake showing the operation end of the machine.



***Recommendations for any job on request.***

6473

CHICAGO DREIS & KRUMP

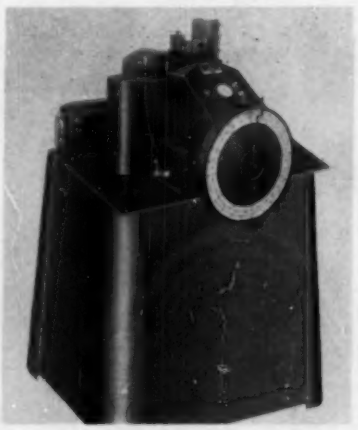
Press Brakes • Straight-Side Presses • Press Brake Dies

Hand and Power Brakes • Special Metal-Forming Machines

# DREIS & KRUMP MANUFACTURING CO.

**7434 South Loomis Boulevard, Chicago 36, Illinois**



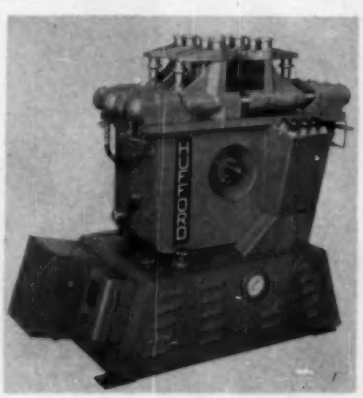
## Automatic Cutoff Machine Handles Either Wire or Flat Stock

Designed to handle either wire or flat stock, this machine has a capacity of up to 3 in. in width and from 2 in. to 30 ft in length for each cut. It will handle several strands of wire or flat stock at one time as long as capacity is not exceeded.

The range of feed lengths is infinitely adjustable. Three different ranges can be selected—short, 0 to 10 ft, with a tolerance of ± 1/64 in.; intermediate, 0 to 20 ft, with tolerance of ± 1/32 in.; and long, 0 to 30 ft, with tolerance of ± 1/16 in.

A pre-set counter stops machine after the desired number of pieces have been produced. Price is $2150.

*Durant Tool Supply Co, 1-15 Thurbers Ave, Providence, RI*



## Latest Hufford Joggler Features Universal Stroke Direction

An improved, hydraulically operated joggler, this machine is unique in that it can apply an adjustable-length stroke in any desired direction around a full circle in a vertical plane.

This machine is built in two sym-

metrical halves along a vertical centerline. One half is stationary, the other slidable. An internal hydraulic ram which can be rotated end for end in a vertical plane through 360° supplies the motion. Ram forces the slidable half of the machine in any desired direction—up, down, horizontally, or at any angle in between. Ram direction is adjusted manually; direction of stroke is indicated on dial.

Max stroke length is ½ in. Load capacity is 18,000 lb. Unit is powered by a 1½-hp, 60-c, 220/440-v, 3-phase motor and weighs approx 1200 lb. Manual electric pushbutton controls actuate all machine functions.

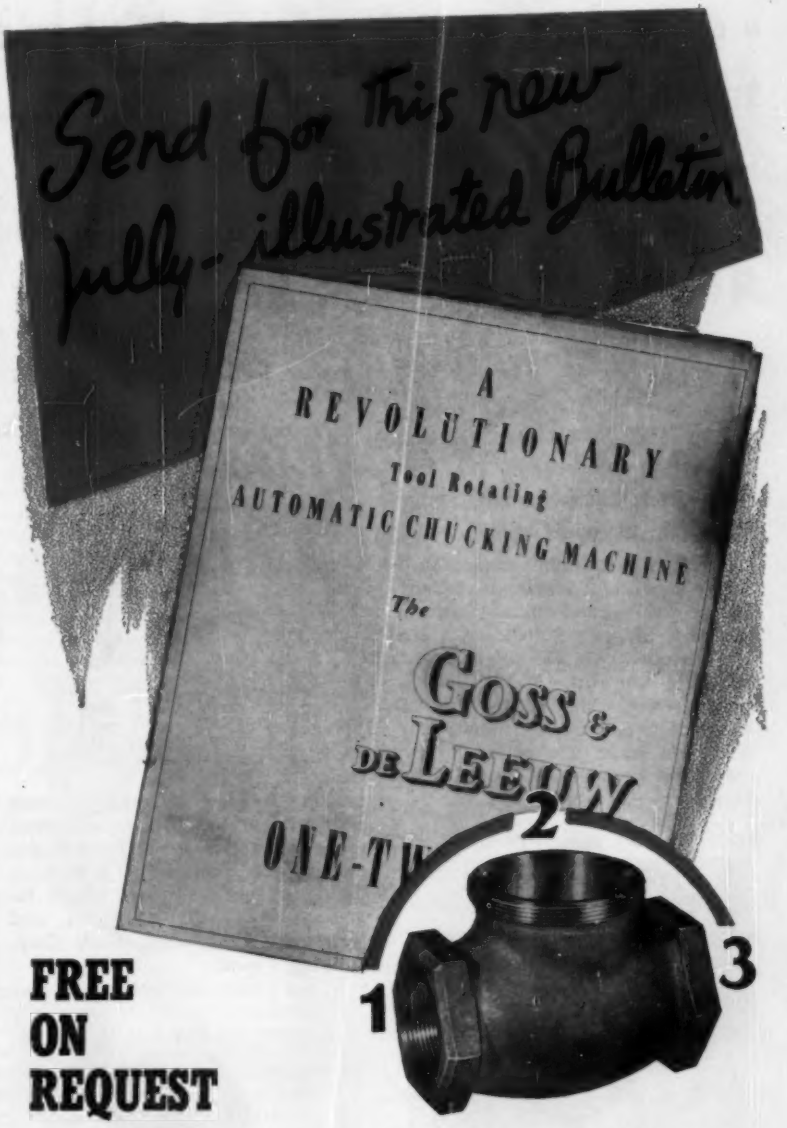
*Hufford Corp, 1700 E Grand Ave, El Segundo, Calif*

## Drillpress Features Speeds to 4000 rpm, Minimum Run-Out

Available as either floor- or bench-type machine, this 16-in. precision drillpress features minimum spindle run-out and accurately maintained squareness between spindle and table. Speed selector dial, with approximate speed ranges for different size drills and different metals, is located at front of machine. Speeds are infinitely adjustable over the range from 150 to 4000 rpm, without the use of special attachments. Helical back gears provide the low speeds; direct spindle drive provides the high speeds.

Drilling capacity is from 1/16 to ⅝ in. Quill stroke is 4 in. The spindle end can have either No. 2 Morse taper or Jacobs chuck taper. Drive motor is ½-hp, 1740-rpm, three phase, 220/440 volt. Floor model, illustrated, stands 66 in. high.

*Electro-Mechano Co, 261 E Erie St, Milwaukee, Wis*

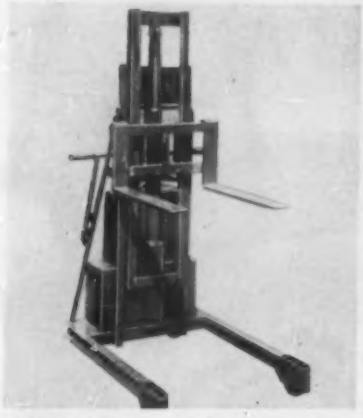

**FREE ON REQUEST**

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously—without changing set up.

*Get this interesting, informative Bulletin NOW—by merely asking for it.*

**GOSS and DE LEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A.**

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



## Multi-Lift is Available With Electric or Manual Lifting

Materials handling unit named Multi-Lift converts, in seconds, to any one of five special units—platform lift, fork lift, barrel handler, crane or bumper jack. Equipped with finger-tip controls, Multi-Lift has electrically operated lifting system. A manually operated unit and a non-telescopic model are available.

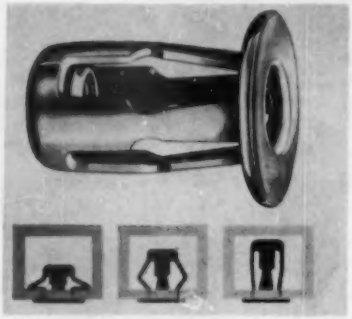
*Stratton Equipment Co, 2040 E 105 St, Cleveland 6, Ohio*

## Drillpresses Feature Infinitely Adjustable Speed, Feed and Stroke

Line of high-speed, automatic-cycling drillpresses features infinitely adjustable speeds, feed range, stroke, feed stroke and rapid approach. Machines are equipped with Morris Air-Oil-Matic drillheads providing complete automatic cycling with fast approach and fast return for drilling or tapping. A positive stop with adjustable time delay makes possible operations such as spotfacing and counterboring. Machines are available in single or multiple-spindle models.

The variable speed drive provides spindle speeds up to maximum of 8000 rpm on the standard machines. Customer may choose from 17 spindle speed ranges. Speeds within each range have a 7 to 1 max to min speed ratio.

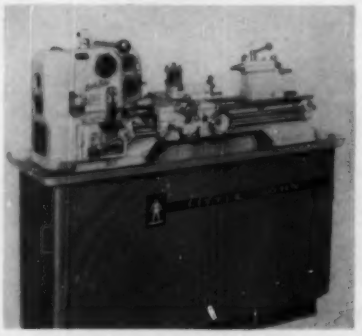
*Secrest Machine Co, 1507 M St, NW, Washington 5, DC*



JACK NUTS can be used as rivets and/or blind fasteners in expansion space as small as 3/8 in. Threads grip any kind of material from 0 to 3/8 in. thick. Available in short length for thicknesses from 0 to 3/16 in., and long from 0 to 3/8 in.—*Molly Corp, Reading, Penna*

SWING JOINTS for machine tool coolant lines are reported to stop all leakage. They are available in two types—in-line and angle—and in four sizes, 3/8, 1/2, 3/4 and 1 in. Bodies are cast bronze—*Combination Pump Valve Co, 849 Preston St, Philadelphia 4, Penna*

TRIPLE DISCHARGE PUMP, Rumaco Model 5S-4520 for outside flange mounting, is available with either 1/10 hp, 3450 or 1725-rpm motor, and in 1/4 hp at 3450 rpm. Various diameter impellers are available for capacities up to 30 gpm and heads up to 27 ft—*Ruthman Machinery Co, Cincinnati 2, Ohio*



## Lathe Offers Infinitely Adjustable Speeds from 38 to 1750 rpm

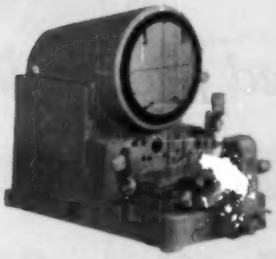
Lathe, designated Little John, is made in England and is reported to offer many design features usually found only in much larger equipment. The lathe swings 10¼ in. admitting 24 in. between centers, with a spindle bore of 1 1/32 in. Headstock is cast integral with the bed. It houses spindle, back gears, layshaft and switch. The 1-hp, infinitely adjustable speed drive provides speeds from 38 to 1750 rpm.

The saddle has a swiveling cross-slide which can be locked in any position. A quick change gearbox enables a range of threads from 4 to 60 threads per in. to be cut without use of changewheels. For metric threads four special gears are provided as standard equipment.

*Distributed by Wickman Products Corp, 10325 Capital Ave, Oak Park 37, Mich*

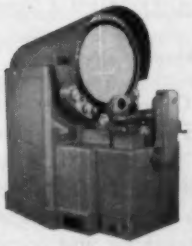
# Speed production with projection gaging

## . . . and the *right* KODAK CONTOUR PROJECTOR

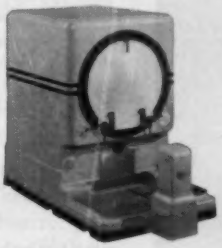


**Model 14-2A**—Do you need a versatile precision measuring instrument for toolroom or production lines? Kodak Model 14-2A measures intricate parts to the order of .0001″, lets you do routine gaging by comparing the part with a chart. Measuring attachment is equipped with micrometer guaranteed accurate to .00005″ over the entire 1″ range. Dial indicator ends need for micrometer feel. Kodak Measuring Blocks, in standard dimensions, can be inserted in the horizontal and vertical micrometers to cover full travel range. Has 14-inch screen. *You can use any Kodak Contour Projector anywhere in normal light.*

**Model 14-5**—Are the parts you have to inspect heavy? Model 14-5, optically the same as Model 14-2A, comes with an extra-large, heavy-duty worktable; its box-like construction withstands great weight without measurable deviation. Model 14-5 has the same measuring range as the Model 30, with 8 inches of table travel in both horizontal and vertical planes. *Optical inspection requires little training, and Kodak Contour Projectors are designed with the operator's convenience in mind.*



**Model 30**—A heavy-duty worktable plus a 30-inch screen makes this the model for toolroom or production inspection of large parts. Table traverse is 8″ in both horizontal and vertical planes, focusing travel totals 3″. Engraved dial, calibrated to 2′ of arc, permits angular measurement reading directly, without need of vernier. *The versatility of optical inspection and the adaptability of Kodak Contour Projectors let you do many measurement tasks with one unit.*



**Model 3**—Check long runs quickly and accurately with this low-cost instrument. Designed for use with your own staging fixtures, Model 3 comes with flat stationary table. Adjustable chart holder permits "set lines" on ground-glass overlay chart to be brought to coincidence with "set surfaces" of the fixture, avoiding need for table movement. *Seemingly impossible-to-measure shoulders, holes, angles, and relationships are easily gaged on Kodak Contour Projectors.*

**Model 8**—Inspect horizontally and vertically, anywhere in your plant with Model 8. Take this cast-aluminum unit wherever there's need for fast, accurate inspection of small parts. For horizontal inspection, simply stage the part in a simple holding fixture. For vertical measuring, turn Model 8 on end and stage the part on a flat glass stage. Part image on the 8-inch screen is erect and unreversed both ways. Six magnifications from 10× to 100×. *Kodak Contour Projectors have rugged housings to more than withstand conditions of normal use.*

Eliminate receiving inspection bottlenecks, avoid waste on reject parts, predict tool failure before it occurs, speed inspection to match production, make final measurements. Which of these Kodak Contour Projectors will solve your production problem?

### How to learn more about Kodak Contour Projectors

From the Kodak Ektar Lens system, (heart of Kodak Contour Projectors), to the precision machining of critical parts, these units are built to meet your most rigid requirements.

To the basic Projector, you can add a number of optional staging and measuring attachments. Your Kodak Representative will be glad to describe these to you and explain their uses.

For the name of our representative or for a descriptive catalog on Kodak Contour Projectors, write to Special Products Sales Division, Eastman Kodak Company, Rochester 4, N. Y.

**EASTMAN KODAK COMPANY**
**Rochester 4, N. Y.**

*the*
**KODAK CONTOUR PROJECTOR**

Kodak
TRADEMARK

# Three case histories

## *How 3 companies improved production by changing to*

# STANICUT Cutting Oils

*Here are reports on three companies that have recorded (1) increases in production (2) better machine performance (3) longer tool life (4) money saved by switching to a* STANICUT *Cutting Oil suited to their operations. You can get similar results.*

Standard Oil industrial lubrication specialist, Ray Wells, and Stuart Bergsma, G. A. Brevik manager, inspect carburetor needle valve. Ray recommended plant's switch to STANICUT Oil 137 BCS. He is well qualified to make such recommendations. Ray is a graduate of the Illinois Institute of Technology with a degree in engineering, and he has completed the Standard Oil Sales Engineering School. He has been an industrial lubrication specialist at Standard for six years.

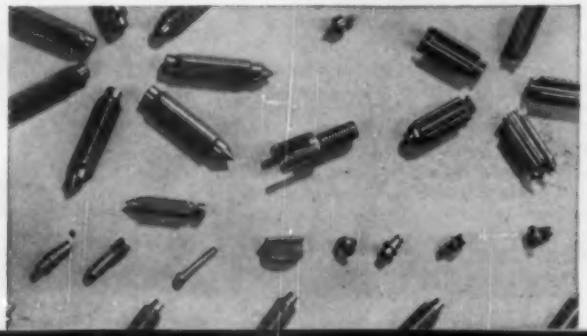
### *G. A. Brevik Manufacturing Company uses STANICUT Oil 137 BCS*

G. A. Brevik Manufacturing Company, Prescott, Michigan, is the largest producer of carburetor needle valves. The company was blending its cutting fluid from four different oils. Still they experienced tool breakage and ring formation on the surface of the stainless steel they were machining. Then one machine was converted to STANICUT Oil 137 BCS to test the oil's suitability for this operation. Soon all machines were converted.

**Production increased 25%** because of the improved performance of the machine tool. Cutting oil inventories have been reduced from four different oils to one. Tool life has been extended. There is no variation in fluids as there was when four oils were being blended, and there is no messy blending operation.

STANICUT Oil 137 BCS is ideally suited for severe, high speed machining.

A few of the stainless steel parts machined on automatic lathes at G. A. Brevik Manufacturing Company using STANICUT Oil 137 BCS.



STANDARD

Some of the pieces manufactured by Dearborn Centerless Grinding Co. Materials used are stainless steel, Inconel and Nichroloy.

Operator George Laverdiere and Standard Oil lubrication engineer, Leland J. Loomis, examine piece just off Cincinnati centerless grinder. Lee Loomis is another man who knows how to advise on metalworking problems. Lee has had ten years' experience in such work, has an engineering degree from Tri-State College and has graduated from the Standard Oil Company's Sales Engineering School.

## *Dearborn Centerless Grinding Co. uses STANICUT Oil 126 BCS*

Difficult-to-grind stainless steel was the problem at Dearborn Centerless Grinding Company. Wheel loading and wheel break-down were such that soluble type oils weren't satisfactory. For this reason, Dearborn began using STANICUT Oil 126 BCS.

**Company management** found it secured these six important benefits by changing to STANICUT Oil 126 BCS in grinding operation:

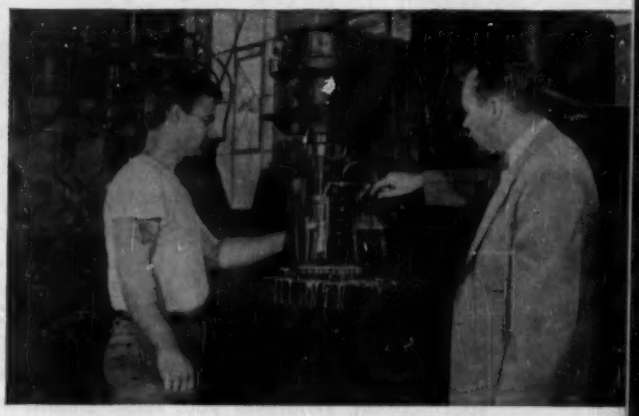
1. Better finishes.
2. More pieces obtained per wheel dress.
3. Superior wheel life obtained on profile jobs.
4. Harder wheels could be used.
5. Finer grit wheels could be used.
6. More stock per pass could be removed.

## *Woodford Manufacturing Company uses STANICUT Oil 155 CS*

This Des Moines manufacturer was drilling and boring a steel wheel fork. Production was at the rate of 45 pieces per hour. Standard Oil lubrication specialist, Jess Nelson, called Woodford plant management's attention to the fact that STANICUT Oil 155 CS was being used successfully elsewhere in the plant. He suggested that much better production and longer tool life would be obtained if STANICUT was used in this operation.

**The change, when made,** increased production to 78 pieces per hour. Tool life was extended. At the same time, by using STANICUT Oil 155 CS, a 46% reduction in cutting oil costs was achieved.

STANICUT Oil 155 CS is an oil especially formulated for use in machining operations involving tough alloy steels which tend to tear and smear.



Woodford operator Elmer Light checks piece in Sundstrand Rigidmill while Standard Oil man Jess Nelson adjusts cutting oil flow. Jess, too, knows how to advise manufacturers on metalworking problems. He's had more than four years' experience doing such work. In addition, he has a degree in engineering from the University of Iowa and is a graduate of the Standard Oil Company's Sales Engineering School.

W. B. Noland, Woodford engineer, demonstrates Rollway Dock Plate to Jess Nelson. Parts machined using STANICUT Oil 155 CS are for this unit designed by Noland.

**STANDARD OIL COMPANY** (Indiana)

Get more data on STANICUT Cutting Oils from your Standard Oil industrial lubrication specialist. One of these men is nearby in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

# Verson

## NOW OFFERS

## INDUSTRY'S MOST MODERN FACILITIES FOR THE FABRICATION AND MACHINING OF MEDIUM AND LARGE SIZED GEARS

● World famous Verson service and facilities for fabricating gear blanks and cutting of fabricated and cast gears are now available on a contract basis.

If you are running into gear problems—bring them to Verson, who offers facilities second to none.

The range of herringbone cutters is from 1¼ D.P. to 8 D.P., diameters up to 122" and face widths to 24". Hobbers will cut spur gears up to 150" in diameter and 48" in face width. Pitch range is 1 D.P. to 12 D.P. Facilities also available for the complete machining and teeth cutting of internal and bevel gears, pinions, worms and worm gears.

Verson equipment is modern, precise and efficient. Operating personnel are highly skilled craftsmen with extensive experience in cutting fine gears precisely to specification. Whatever your requirements in medium and large gears it will pay you to take advantage of Verson's services.

Facilities available for fabricating and machining of light and heavy weldments.

**Get the complete Verson Story**

Send for Bulletin F-57, a colorful 32-page book, generously illustrated, which gives you an on-the-spot look at Verson . . . a complete organization with all the facilities, know-how and experience to do your job right.

*A Verson Press for every job from 60 tons up.*

-Verson-

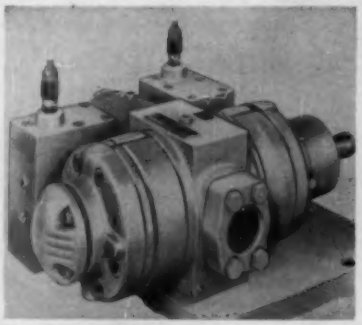
ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

**VERSON ALLSTEEL PRESS CO.**

9200 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES


## NEW SHOP EQUIPMENT



**DOUBLE PUMPS (Series QGH-H) for hydraulic oil service are available with either base or flange mounting, with or without panel-mounted valve combinations. Capacities of each cartridge section range from 3 to 18 gpm, or any combination of these volumes; speeds of 1200 and 1800 rpm, pressures up to 2000 psi. Catalog section G-114—*Gerotor May Corp, Owings Mills, Md***

**Adhesives** for bonding treated Teflon (etched surface) to itself or to any material that will bond with an adhesive include Ray-Bond R-86004, a thermosetting, two-component product, curable at room temperature, recommended where the maximum chemical resistance is required. R-86024, with same features, is for economical bonding of Teflon for dry applications. R-81001 can be used to bond assemblies subject to temperatures up to 400 F for prolonged periods.

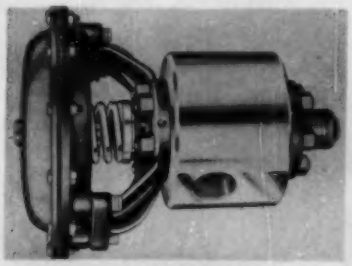
*Raybestos-Manhattan, Inc, Adhesives Department, Bridgeport 2, Conn*

**Clear wax emulsions,** No. 5003, 5009, 5015 and 5016, are used as protective coatings and dry film lubricants. They are recommended for use over phosphated, bonderized, anodized and most other treated surfaces. They can be used as mold release agents, lubricants on steel strapping and shell cases, and as protective coatings for copper, brass and aluminum.

*S C Johnson & Son, Inc, Special Industrial Products Dept, Racine, Wis*

**Spherical rod end bearings,** designated Alinabal, are available with self-lubricating sintered metal balls and full spherical race of hardened steel ground to match ball curvature. Bore sizes currently stocked are ¼ to 1 in. in both male and female type.

*Carter Engineering Co, Ferrysburg, Mich*



## 6000-lb Control Valves Feature Aluminum Bronze Bar Stock Bodies

Line of 2 and 3-way units is designed for use on plastic molding, ceramic forming, and similar equipment requiring extremely high operating pressures. Use of aluminum bronze bar stock in body construction is said to eliminate distortion under highest working pressures.

Available in ½ through 2-in. NPT sizes, valves are for use with Sinclair-Collins cycle controllers, with any applicable pneumatic or electro-pneumatic cycle control device, or for manual operation. Valve diaphragm is actuated by 35 to 40 psi air. They are available either normally open or normally closed, with fully balanced stems.

*Sinclair-Collins Valve Co, 454 Morgan Ave, Akron 11, Ohio*

**Electric valve operator,** explosion-proof SM-11-X Valvetrol, provides proportional flow control from ac or dc signal, mounts directly on stem of rotary valves. Built-in precision potentiometer or differential transformer provide positioning accuracies of ± 1/5 of 1% of full scale for standard models, or ± 1/25 of 1% in special types. Single phase capacitor, 2 or 3-phase units are available.

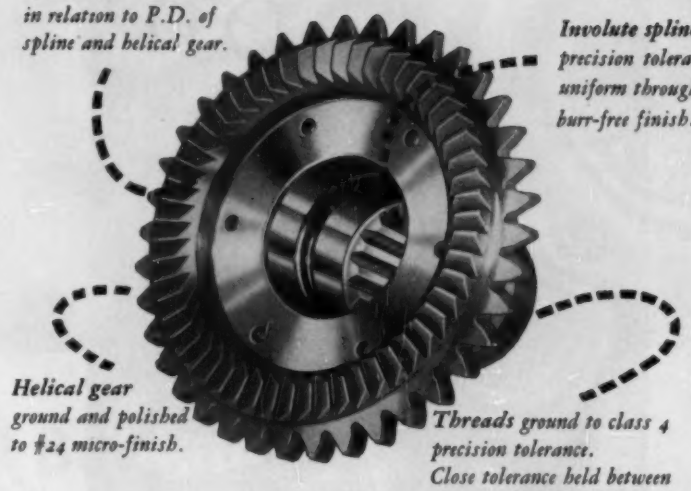
*Jordan Co, 3235 W Hampton Ave, Milwaukee 9, Wis*

**End face seals,** designated Standard, are reported to provide maximum sealing efficiency in minimum space. They are available in two series—long and short. Specifications include ¾ to 4-in. shaft sizes, pressures to 500 psi, temperatures to 500 F, peripheral speeds to 15,000 fpm. Bulletin EF-100 available.

*Chicago Rawhide Mfg Co, 1301 Elston Ave, Chicago 22, Ill*

**HSS power hacksaw blades** are available in sizes 12 to 30 in. long, 1 to 2½ in. wide, 0.050 to 0.100 in. in thickness, with 3, 4, 6, 10, and 14 teeth per in.

*Ladish Co, Cudahy, Wis*



Generated clutch held at close tolerance in relation to P.D. of spline and helical gear.
Involute spline, precision tolerance, uniform throughout, burr-free finish.
Helical gear ground and polished to #24 micro-finish.
Threads ground to class 4 precision tolerance. Close tolerance held between thread and P.D. of helical gear.

# DON'T GAMBLE WITH GEAR PERFORMANCE

YOU know that gambling with gears can cost you money — production delays, costly rejects, failures in use. You don't want to take chances with your customers . . . they expect day-in, day-out performance from your machines. Your performance guarantee can be Perkins custom-cut gears . . . precision gears made to your exact specifications. Perkins' 52 years of gear-making know-how, extensive facilities and equipment, and rigid production controls assure uniform tolerances throughout . . . *plus* a consistent micro finish. You get perfect meshing and full capacity from every gear. Many leading manufacturers — Sikorsky, Stanley, Universal Winding, for example — rely on Perkins for top-quality gears, gears that cost less in the long run. Ask us to quote on your next gear requirement. Then judge for yourself.

**YOURS ON REQUEST** Folder illustrating gears Perkins has made — face gears, generated and curvic clutches; bevel, spiral, helical and spur gears; ratchets, sprockets and ground thread worms — from all materials. Includes Perkins facilities for producing various gear types and sizes. *Write today.*

**PERKINS**
**MACHINE AND GEAR CO.**

**Dept. 26, 101 Circuit Ave., West Springfield, Mass.**
**Telephone: REpublic 7-4751**

rush it to CDT

Get those tough special design jobs off to Columbus Die-Tool for quick action. An outstanding engineering staff backed by 50 years of Company experience can make tough jobs look easy.

Whether it's special tools, jigs, fixtures or even special machinery, you'll find that CDT can build them better, faster and more economically. That's why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool.

Perhaps we can solve your tooling problem and help you make your product . . . better, for less.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

*Designers and manufacturers of* JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

NEW SHOP EQUIPMENT

## Die Handling Table Lifts and Moves Loads up to 2500 lb

Die handling table tradenamed Big Beulah lifts loads of up to 2500 lb; transports them and slides them to another surface without manual strain or risk of damage to either load or operator. Unit is said to be ideally suited for handling dies, but may also be used for a wide variety of lifting, moving, and maintenance work around the shop.

Reinforced top-plate measures 22 x 34 in. and is fitted with eight recessed, free-rolling conveyor rollers for ease in moving loads. A ram, impelled by a screw-and-nut device, travels the length of the top-plate, pushing loads from table to press or storage shelf, and pulling loads from press or storage shelf to table.

Table rides on 9½-in. metal wheels and 4-in. metal casters. A top-plate similar to that on the Big Beulah may be purchased separately for use as a flange-mounted accessory on present tables.

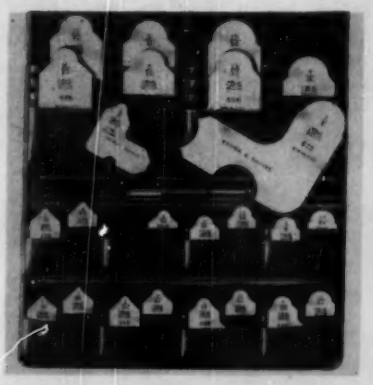
*Hamilton Tool Co, 830 S Ninth St, Hamilton, Ohio*

**Circular saw line,** chrome-plated Si-Clone designation, for light industrial use, is available in nine types with choice of round, square, oblong, or diamond shape centerhole. Furnished up to 12 in. in diameter inclusive. Catalog B.

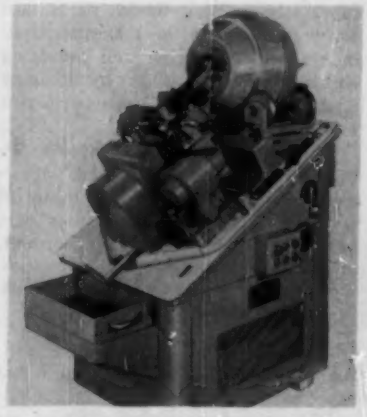
*Simonds Saw & Steel Co, Fitchburg, Mass*

**Hacksaw attachment** turns any ¼-in. electric drill into a hacksaw, jigsaw or coping saw in a matter of seconds. This ball-bearing unit is capable of cutting light metals. Up to 9/16 in. is provided for chip clearance and a specially designed cam reduces saw

speed to one-half of drill speed. Attachment weighs only 11 oz.
*Aladdin Mfg Co, 128 Wirthman Bldg, Kansas City, Kan*

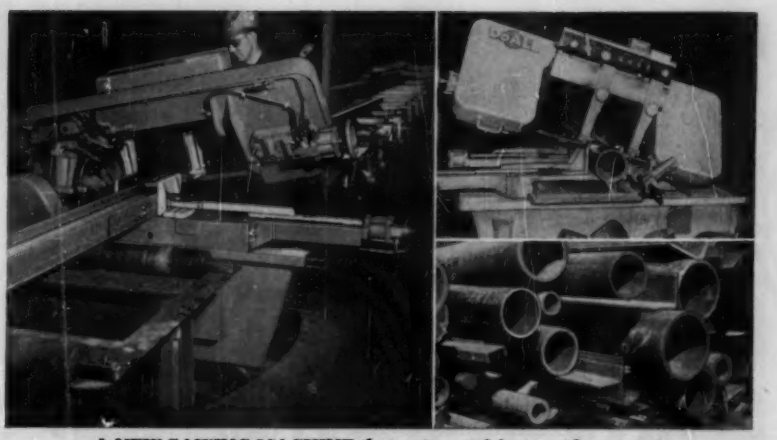


**RADIUS GAGES, Series 628, cover radius range from 1/32 to ½ in. Each gage has five different gaging edges, permitting testing of both convex and concave radii even when recessed, and making testing of corner radii easy. Gages are stainless steel and are furnished with an interchangeable holder. They are available in three sets: 1/32 to 17/64 in. by 64ths, 9/32 to ½ in. by 32nds, and a combined set of both ranges. Sets come with case. Bulletin available—*Brown & Sharpe Mfg Co, Providence, RI***



## Screw Slotting Machine Features Rotary Hopper Feeding

Screw slotting machine handles screw blanks from No. 2 to 5/16 in. (nominal) up to 2½ in. long. Complete changeover from one screw size to another can be made in approx 15 minutes. To provide more efficient and trouble-free feeding, machine has been equipped with a variable speed rotary hopper feed

**A NEW SAWING MACHINE that cuts metal faster at lower cost.**

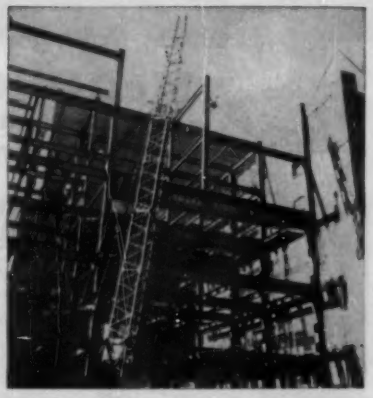
# Building America with "Tools" . . .

Men with axes and strong backs built the first buildings in America. Now the "tools" of building are steel mills and cranes, riveting hammers and sawing machines.

The man with the modern tool is way ahead of the pioneer with the axe. Because he produces more, he owns more. And every time he is provided with a more efficient tool he becomes more productive. Everybody benefits. America grows stronger and its people enjoy great abundance.

The picture above provides an example of this process. The new DoALL bandsawing machine is helping build a skyscraper and a way of life. It is cutting-off structural steel at lower cost than any previous machine for the purpose. Its continuous-cutting saw band is made of *high speed steel* which cuts up to 10 times faster and lasts up to 30 times longer than ordinary carbon steel bands. Thus, tool cost is lower and wasteful downtime is reduced. The cut is clean. No man-hours need be wasted removing burrs, as was the case with the saw formerly used.

The Power Saw is used in manufacturing for high production sawing. When many pieces of the same length are required, it is equipped to automatically feed, index and cut-off one piece after another.



**From skyscrapers to schools, America is built with tools.**

From the axe to the Power Saw, tools have built America. Only through continuously greater use of new and better tools can progress continue and living improve for more and more people.

The DoALL Company offers industry more than 1500 new and better machine tools, cutting tools and gaging tools to increase human productivity.

**Reprints of this series on economics plus "economic kits" available for employee education.**

**ASK FOR DoALL POWER SAWING HANDBOOK describing how to cut cut-off costs. Free on request. Call DoALL locally, or write.**

**The DoALL Company**
**Des Plaines, Illinois**
**38 Local Sales-Service Stores** E-39

## Make accurate set-ups *faster* with this 25° Tilting Spindle

The STERLING Model "G-2" Universal Tool and Cutter Grinder provides this extra feature plus complete versatility and more capacity than comparable machines at *lower cost.*

Swing 10¾" over table, 27" between centers, 18" table travel with 8¼" cross feed. For complete details and specifications write for FREE Bulletin "G-2".

**Grind 90° to 140° Included Angle on *ALL DRILLS*, ⅛" to 2½"**

No collets or chucks makes set-ups easy. Clearance gauge insures accurate, positive clearance angle. True conical grinding produces full clearance from center to outside. Write for FREE Bulletin "DV-1".

**McDONOUGH MFG. CO.**
1526 GALLOWAY • EAU CLAIRE, WISC.

## *Six machines protected from dust by Torit for* $666.15

This Torit Dust Collector, Model 219FM, was installed by the Mohr Lino Saw Co., Skokie, Ill., to protect 3 belt sanders and 3 other grinders (2 grinders hidden from view) from destructive dust. Total cost of collector *plus* all accessories was an astonishingly low $666.15!

After one year's operation, Mohr Lino Saw says this about their *low-cost* Torit installation: "Our Torit installation has proved efficient and economical—an excellent investment because it has kept our shop *cleaner*, our operators *happy*, and *protected vital* machinery."

Just as Mohr Lino Saw Co. did, you can achieve greater machine protection and cleaner working conditions by trapping dangerous or valuable dust *at its source* with a completely *self contained* and *portable* Torit Dust Collector. For full details on Torit's complete range of types and sizes, write to . . .

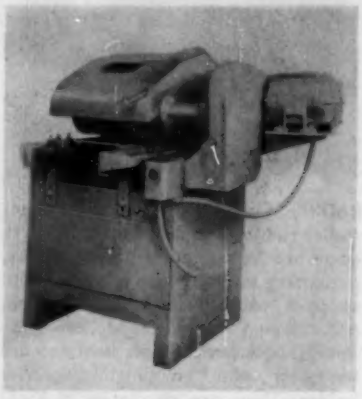
**TORIT MANUFACTURING CO.**
Dept. 406, 311 Walnut Street, St. Paul 2, Minn.




unit. The hopper is enclosed with spill-proof guards to insure against loss of blanks.

Deburring costs are cut in half through the use of a rotating mechanism which employs replaceable HSS inserts. A separate cooling system with an independent motorized pump is incorporated into the machine. Literature available.

*Roy Machinery & Sales, Inc, New Britain Ave, Farmington, Conn*



### Abrasive Belt Machine Finishes Small Metal and Plastic Parts

Abrasive belt machine, designated Speedbelt 12, is designed for deburring, polishing or finishing of small metal, wood or plastic parts. It is especially useful when parts are conveyor-fed into the machine. Used in tandem, deburring and polishing can be done in sequence by utilizing abrasive belts of different grit size on the two machines.

Unit is available with three types of feed tables. Positive feed adjustment can be made for any material up to 2 in. thick. Machine is also available with an 18-in.-wide belt.

*Timesaver Sanders, PO Box 7446, Robbinsdale Station, Minneapolis 22, Minn*

**Technocheck valve** with internal viscous dampener is designed for applications where hydraulic and air shocks of magnitude are encountered. Advantages are tight sealing and low pressure drop with no external dashpots, shafts, controls, or linkages required outside the valve. No springs are used and functioning of dampening device is positive. Sizes range from 4 to 36 in. in dia; furnished in variety of metals and alloys. Bulletin VD-2.

*Techno Corp, 16 W 5th St, Erie, Penna*

90 to 3750 r.p.m. The right speed for the job! Controlled by convenient lever on front of cabinet. Precision dial shows selected speed. No belts to change—no tools to bother with!

Put this 1⅛" collet capacity, 9" swing lathe in your shop for the fine, fast and variable work uneconomical on larger machines. Learn how you'll out-produce and under-cost by *writing for Bulletin 918SL.*

**RIVETT LATHE & GRINDER, INC.**
Dept. AM12B
Brighton 35, Boston, Massachusetts

*Symbol of Accuracy in Machine Tools*

## THIS is No Ordinary Power Hack Saw Blade

This is the *unbreakable* MARVEL High-Speed-Edge Hack Saw Blade—the first bi-metal blade—invented, developed and introduced by MARVEL. This blade was developed to cut any material from the free machining steels to the toughest alloys, fast, accurately and economically. Just one type blade to handle any job—no switching blades to cut different materials.

MARVEL blades can be tensioned from 200% to 300% more taut than ordinary blades. This advantage permits heavier feed pressures to be used without deflection or fear of breakage.

This rugged cutting tool assures outstanding economy, accuracy, long life and complete safety—*it is unbreakable.*

Ask for MARVEL Blades by name and you can be sure you're getting the best. Leading Industrial Distributors have them in stock. Write for latest Cutting Tool Bulletin. FB-1021

**ARMSTRONG-BLUM MFG. CO.**
5700 W. Bloomingdale Ave., Chicago 39, U.S.A.
***Manufacturers of the Outstanding MARVEL Metal Saws***

## Turchan

## TRACER SPECIALISTS SINCE 1933

***IT'S SIMPLE TO CONVERT YOUR PRESENT MACHINES TO AUTOMATICS WITH A TURCHAN TRACER PACKAGE. THE COST IS SMALL—RESULTS GREAT! NORMAL OPERATION IS NOT AFFECTED***

**WRITE for LITERATURE**

**TURCHAN FOLLOWER MACHINE CO.**
26950 VAN BORN RD. • P.O.B. 6055 • DEARBORN 9, MICH.

## TANNEWITZ

VARIABLE SPEED TOOL ROOM BAND SAWS AND HIGH SPEED METAL CUTTING BAND SAWS . . . SINGLE OR VARIABLE . . . 50 TO 15,000 FPM. PRODUCT OF MORE THAN 50 YEARS OF SPECIALIZATION. Write or phone.

The TANNEWITZ WORKS Grand Rapids, Michigan

**A SPECIALIZED CAM MILLING SERVICE**
**Over 100 Types of INDEXING TURNTABLES**
*Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Spraying, Welding and Soldering*

**CAMS OF ALL TYPES**

*Dr. Chas. Eisler ME, Founder*
*Chas. Eisler, Jr., Pres.*

Ask for Catalog 55C

*Contract production; Special automatic machines*

**EISLER ENGINEERING CO., INC.**

## DAVIS KEYSEATER

**This low cost machine will handle internal keyseating jobs up to 1 in.**

***Write for illustrated bulletin.***

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

Write for list of Special Reports currently available from

**Reader Service Department**

**American Machinist**
McGraw-Hill Bldg., New York 36, N. Y.

RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

***Write for literature and don't forget to send samples.***

**THE GRANT MFG. & MACHINE CO.**
85 Silliman Ave., Bridgeport, Conn., U. S. A

**SHORE SCLEROSCOPE HARDNESS TESTERS**

***Pioneer American Standard SINCE 1907***

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

*OVER 40,000 IN USE*

**THE SHORE INSTRUMENT & MFG. CO., INC.**
90-35B Van Wyck Exp.
Jamaica 35, N. Y.

MODEL D

MODEL C-2

Answers to hundreds of METALWORKING questions — on planning and production — COMPLETE IN ONE EASY-TO-USE VOLUME

## What leading magazines say about this book

**AUTOMATIC MACHINING:** "Offers quick answers to metalworking problems of a practical nature."

**DESIGN NEWS:** "Digests essentials of a vast amount of original source material that would otherwise prove difficult to obtain even when one knows where to look."

**WELDING JOURNAL:** "A valuable aid to machinists, designers, draftsmen, and engineers."

**MECHANICAL ENGINEERING:** "Emphasis throughout is on up-to-dateness, comprehensiveness, and practicality."

**AUTOMOTIVE INDUSTRIES:** "Provides a storehouse of useful tables and formulas, plus a convenient-sized encyclopedia of up-to-the-minute information on modern metalwoking methods, material, and equipment."

**MANAGEMENT DIGEST:** "Completely new and truly up to date."

**PRODUCT ENGINEERING:** "As a reference handbook, as a volume for self-study, as a practical summary of man's up-to-date methods of working metal, this complete revision of Colvin's and Stanley's original handbook should prove valuable to all those active in the manufacturing process."

# The NEW AMERICAN MACHINIST'S HANDBOOK

### 45 SECTIONS

Part I. MACHINING METHODS—1. Broaches and Broaching. 2. Drills and Drilling. 3. Files and Burrs. 4. Gears, Splines, and Serrations. 5. Grinding, Honing, Lapping, and Superfinishing. 6. Milling and Milling Cutters. 7. Planing and Shaping. 8. Reamers and Reaming. 9. Saws and Sawing. 10. Threading Processes and Thread Systems. 11. Taps and Tapping. 12. Turning and Boring. 13. Screw-machine Work.

II. METAL-FORMING METHODS—14. Metal Spinning. 15. Pressworking and Cold-pell Forming. 16. Forging, Upsetting, and Cold Heading. 17. Cold Working of Metals. 18. Die Casting. 19. Babbitting of Bearings.

III. ASSEMBLY METHODS—20. Arc Welding and Surfacing. 21. Gas Welding and Oxygen Cutting. 22. Resistance Welding. 23. Brazing. 24. Soldering and Soft Solders.

IV. MATERIALS—25. Steels and Irons. 26. Non-ferrous Metals. 27. Heat-treatment of Metals. 28. Gages, Tolerances, and Weights of Metal Products.

V. FINISHING OF METALS—29. Metal-cleaning Processes. 30. Plating and Metal Coating. 31. Paint and Painting. 32. Electrolytic and Chemical Finishes of Metals.

VI. INSPECTION—33. Limits, Fits, and Tolerances. 34. Measuring and Gaging Equipment. 35. Tapers and Dovetails.

VII. FASTENING DEVICES — 36. Bolts, Screws, Rivets, and Washers. 37. Keys and Pins.

VIII. TOOL ENGINEERING AND DRAFTING PRACTICE—38. Jig and Fixture Details. 39. Drafting Practice and Engineering. 40. Surface Finish.

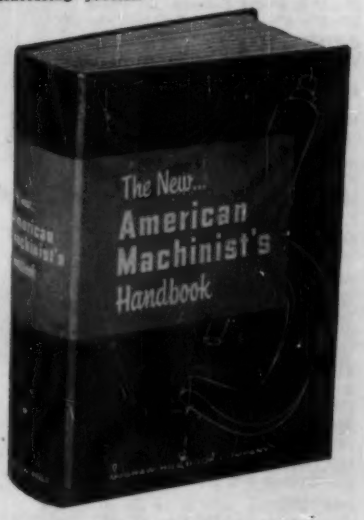
IX. MACHINE-TOOL STANDARDS — 41. Standard Machine-tool Elements. 42. Machine-tool Inspection.

X. POWER-TRANSMISSION EQUIPMENT—43. Chain, V-belts, and Motors.

XI. MATHEMATICS AND TABLES—44. Mathematics. 45 Reference Tables.

**Edited by RUPERT LE GRAND**
Senior Associate Editor, American Machinist
1579 pages, 5¾ x 8,
774 illustrations, $11.00

- **80% REWRITTEN**
- **REARRANGED TO GIVE MORE FACTS—EASIER REFERENCE**
- **FULLY UP TO DATE**




Here is a treasury of the kind of machine shop information that will help every man to save time and avoid trouble in his own work, to go ahead on any job with confidence, and to improve his skill, reputation, and earning power. And, overall, the shop benefits, too, in time saved in set-up and operation, in reduced delays and spoilage, and in improved results.

Just think of being able to find the answer—the dependable answer — to almost any question — quickly — layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances—any detail of machine shop or drawing room practice. The New American Machinist's Handbook presents this kind of information, in the form in which you can best understand and use it.

As the English journal, **Machinery Lloyd says,** "So vast in its scope and wide in its coverage that it is difficult to do it justice in a short space." Get the best measure of the book's worth for you from the book itself. Send for it, without obligation, for free examination.

**SEE THESE BOOKS FOR 10 DAYS FREE — JUST SEND THIS COUPON**

### INDUSTRIAL ENGINEERING HANDBOOK

Puts a wealth of dependable information at the fingertips of industrial engineers and management men. Covers all aspects, from materials handling, job evaluation, work measurement, and plant facilities and design, to automation, and linear programming. Factual and how-to-do-it in approach. Prepared by over 70 specialists. H. B. Maynard, Editor-in-Chief. 1512 pages, illustrations, $17.50

### HANDBOOK OF FASTENING AND JOINING OF METAL PARTS

Ready reference guide helps in selecting best methods for specific jobs of fastening, joining, and connecting metal parts for assembly. Covers such methods as screw thread and nuts, welding, collars, couplings, keys, brazing, soldering, resins, adhesives, etc. An outstanding feature is the easy-to-follow 200-page section in picture and caption style. By V. H. Laughner and A. D. Hargan. 622 pages, over 3,500 illustrations, $15.00

McGRAW-HILL BOOK CO., INC., Dept. FAM-12-30-57
321 W. 41st St., New York 36, N. Y.

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will pay for book(s) I keep, plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if remittance is sent with this coupon; same return privilege.)

- ☐ Le Grand—New Amer. Mach. Handbook, $11.00
- ☐ Maynard—Industrial Eng. Handbook, $17.50
- ☐ Laughner & Hargan—Hdbk. of Fasten. & Join. Metal Pts., $15.00

(Print)
Name .....
Address .....
City & Zone ..... State .....
Company .....
Position .....

For prices & terms outside U. S. write McGraw-Hill Intl., N. Y. C.

FAM-12-30-57

S&S has Everything in machine tools

NEW...USED...REBUILT...

ALWAYS 2500 TOOLS IN STOCK

FOR SALE OR RENT

TERMS UP TO TEN YEARS

UNUSUAL MACHINES

VERTICAL BORING:
7"—8"—10"—12"—14"—16" Bullard Mult-Au-Matics
35' Sellers & 24' Niles—1941
42" — 30" Bullard Man-Au-Trol—1946

HORIZ. BORING:
10" Sellers, 10" Bredo—1954
4"—5" & 6" G & L—1945
2"—3"—4"—5" Supermill Table Type—New

GRINDERS:
Van Norman #418 Cylindrical — 1955 (never used)
#2 Brown & Sharpe Univ. Cylindrical—1955 (never used)
Norton & Landis 10"x36" up to 24"x240" Like New
100" Frauenthal Double Head Vertical—1943
(2) Cincinnati Tool & Cutter—1948
6"x15" up to 12"x45" J & L Thread—1947

UPSETTERS:
9" Nat'l Air Clutch—Weight 500,000 lbs.—1942

GEAR PLANER:
144" Gleason Spur & Internal—1943

PLANERS:
10'x8'x20' up to 15'x10'x36'—1943

LATHES:
156" Swing x 50' CC Niles—Available "Rebuilt"
10 EE Monarch Tool Rm w/Air Tracer, '54

VERTICAL MILLS:
#10 Portland—32"x122" Table—1957
#6 Supermill Knee Type—67" Long. Travel—'57

JIG MILLS:
3B DeVlieg—1952

MILLING MACHINES:
#3—4—5—6 K & T & Cincinnati—1948

PRESSES:
Cleveland Toggle—200 Ton—48"x48" "Bed-20"& 14" Stke.—1952
Bliss Hydro Dynamic—72" Stke.—1945
Beatty #118—350 Ton—1945

TURRETS:
Warner & Swasey 1AC Chucker—1948

SHAPERS:
Rockford Hydraulic—24"

SAW:
Do All 36HP Hydro Feed—1951

ATTENTION DEALERS

We cooperate fully with you in serving your customers. Our complete buying, selling and rebuilding facilities are at your disposal.

Write Today For Complete S & S Catalog

S&S MACHINERY COMPANY

145 53rd ST. BROOKLYN 32, N. Y.

PHONE - HYACINTH 2-7400 CABLE: SANDSTOOLS

WEST COAST | 6945 BANDINI BOULEVARD Los Angeles 22, RAymond 3-9231

## THE SURPLUS MACHINERY MARKET

• **Used machinery market has settled into a quiet,** steady sidewise movement at a level slightly higher than this summer's. Most noteworthy trend in recent weeks has been a decided loosening up in availability of good quality machines for purchase by dealers.

**Several dealers report** that they have gotten excellent prices on the buying side. One example: a standard internal grinder that was price-tagged at $2000 a year ago was recently purchased by a dealer for $1200.

**A dealer says, "If a customer wants to talk price with us,** we're certainly a lot more willing to do so today than we were just a year ago." That's not to say this firm is making any across-the-board cuts—it's just a little more flexible, that's all.

• **Although inquiries have tapered off considerably** from this summer, when a lot of shopping and very little buying keynoted the situation, the people who visit dealers' showrooms now are really in the market for used machinery. Most of them put off buying as long as they possibly could, now find better machines are essential to continue production.

• **In these days of general leveling off in production** and sharp declines in such crucial industries as aircraft and aircraft components, government competition in the used machinery market is becoming crucial. The government's offerings, either through sealed bids or auctions, are still attracting large numbers of bargain hunters who apparently don't mind buying a pig in a poke (no dealer guarantee and no chance to really inspect the machine for defects)—as long as the price tag seems low.

**The situation has gotten so bad** in those areas where government auctions are frequent that dealers are being asked by customers how much they ought to bid on certain government surplus machines. Because it's his customer who's making the request, the dealer has to help out.

**But it's an ill wind that blows no good**—more than once a customer has come into a dealer's showroom with such a request, seen a similar machine on the floor (nicely reconditioned and guaranteed), noted its price, gone to the auction and found the government machine to be in far poorer shape, watched the government machine go for almost as much or as much, promptly returned and bought the dealer's machine.

• **Possibilities of an export market for used machine tools** is being investigated by the Machinery Dealers National Association's Industry Affairs Committee.

**Helpful along this line, MDNA finds,** are two Commerce Dept publications, its "Trade List," (Price: $2) and *Foreign Commerce Weekly* (Subscription: $3.50 per year), which contains a section on "World Trade Leads," wherein foreign firms list their wants. This section also lists the arrival of foreign buyers, where they're staying in the U S, and how long they'll be here.

**You can also get an individual survey** geared to meeting your needs in selecting an overseas agent or distributor from the Commerce Dept for $10.

**Then, if you're still interested,** Commerce Dept has a 15-page booklet (20¢) that tells you "How to Apply for an Export License and How to Use It." Another, at $1.50 per copy is titled "An Introduction to Doing Import and Export Business," is put out by the U S Chamber of Commerce, Washington 6, D C.

# EASTERN'S WAREHOUSE IS THE WORLD'S BEST STOCKED

**You'll find more and better machine tools in Eastern's warehouse. What you need when you need it—with a "no questions asked" guarantee of complete satisfaction!**

Eastern's warehouse. Floor space 134,000 sq. ft. Average stock 1500 machines.

The 134,000 square feet of floor space in Eastern's modern warehouse accommodate an average stock of 1500 machine tools! Normal inventory available for prompt shipment includes everything from bolt cutters to engine lathes to boring mills, assuring you of a wide selection at all times.

Eastern's machines were all originally high-grade machines thrown on the market through conversions, reorganization or changes in methods. You as a buyer may purchase machines to suit your needs; buy them **REBUILT**; buy them **RECONDITIONED**; or buy them **AS IS.** A REBUILT EASTERN MACHINE is completely dismantled, all bad or worn parts replaced with new ones, all sliding surfaces replaned or re-ground and scraped, expertly reassembled and checked by highly trained specialists. The machines are tested rigorously to conform to the original manufacturers' standards of accuracy, and any of the 1500 machines in Eastern's warehouse carries a guarantee of "Performance Test As When New", if machines are purchased rebuilt.

All surfaces on this lathe bed have been replaned to manufacturer's original limits of accuracy on this 40' Planer.

**Doesn't it make sense to begin your search for machine tools at Eastern's warehouse?**

*Write today for latest stock list and informative illustrated booklet "The How, Where and Why of Rebuilt Machinery."*

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio MElrose 1-1241 "TWX" CI-174
CABLE ADDRESS EMCO

## LATHES

Lodge & Shipley 18"x10' geared head, Taper, shuck, MD
American 18"x8' geared head, Taper, shuck
Bovo & Emmco 32"x14' CD, Q.C.G., motor, taper
Lehmann 18"x9', geared head, taper chuck

## GRINDERS

Cincinnati Centroless, Nos. 2, 3 & 4
B & S Surface, #2 8"x19', motor spindle
Hanchett Surface, Vertical Hydraulic #300, 12"x 48", 25 HP
Cincinnati Cylindrical, 8"x18", Hydraulic

## MILLERS

Milwaukee #2B Plain Double overarm, S.P.D.
Kempsmith #2 Vertical Miller, Maximiller, all geared, motor-in-base
Ohio #3 Universal, S.P.D., Geared Head
Stokerunit #33 Simplex, Production, R.T. Late type

## MISCELLANEOUS

Horizontal Boring Mill, 3" G. & L. M.D.
Punch Press, #6 Bliss 60-Ton O.B.I. Flywheel type, 3" stroke, M.D.
Ferracute 2C-15 55 Ton OBI Punch Press, 3" stroke
Brake, Dual 10' x 10 gauge or 8' x 3/16" all steel Power Press Brake, M.D.
Shaper, Ohio 24", GBD, power down feed, R.T., late type

*Phone, wire, or write your inquiries for any machines to fill your needs. Above only partial listing of our large stock.*

**Phone: CEntral 1-9360**

McDONALD Machinery
1537 N. BROADWAY
ST. LOUIS 6, MO.

HD MACHINE TOOLS
NEW - USED REBUILT MACHINERY

*Serving the World's Largest Manufacturers*

Hilles & Jones Pyramid No. 8, 14' x 9/4" capacity.
4B Kearney & Trecker Heavy Duty Vertical Miller Serial 3-1175.
3½" Bar Landis No. 85 Floor Type Horizontal Boring Mill Serial No. 8119
35" Hanchett Vertical Spindle Surface Grinder Serial 38-133.

HAZARD BROWNELL MACHINE TOOLS INC.
350 WATERMAN STREET PROVIDENCE 6, R. I. DEXTER 1-8880

BENNETT MACHINERY CO.

BORING MILLS, 4" Sellers, Thin Type, Late
8" bar Yoder, Table Type, 1944
10" Niles Vertical, 2 Hds. M.D.
20" & 24 Bullards, New Era Type
5" Sellers Thin Type, Late
GRINDERS No. 36 Hanchett Vert. Rotary, 44
30" x 42" P. & W. Vert. Surf., '47
60" Hanchett Vert. Spin. Surf., No. 300
10" x 20" B. & S. No. 1 Univ., 1942
LATHES, 36" x 21' cen. N.B.P. Grd. Hd., T.A.
25" x 40" cen. LeBlond, 31" sw., '41
18"x78" cen. Sidney, T.A., 18½" sw., 1952
TURRETS, Nos. 2L, 3 & 3 Gisholts, Late
Nos. 2 W. & S. & 2 & 2B Moreys, Late
MILLERS, No. 3A B. & S. Univ. Tim.
No. 4B K. & T. Vert., Table 102" x 19" oversize
RADIAL DRILLS, 6'10" col. Carlton, M.D.

375 Allwood Rd., Clifton, New Jersey
Phone: PRescott 9-8996 N. Y. Phone: LOrgarre 3-1722

## BLANCHARD GRINDING

**To 85" diameter and up to 20"x120"**

- 24 Hour Service
- Ground Steel & Aluminum Plate, any size, shape or thickness.
- Weldments
- Shear blades sharpened up to 10'

**SAL METAL PRODUCTS CO.**
DEPT. AM
120 Freeman St., Brooklyn 22, N. Y.
EVergreen 9-2560

## SEARCHLIGHT SECTION

# FALK
## MACHINERY COMPANY

*Every Item Guaranteed as Represented*

*Every Item Guaranteed as Represented*

### LATHES

42"x32' Centers NILES Grd. Head Lathe.

4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 3, 4, 5, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking, Late.

No. 1L, 2L GISHOLT Univ. Turret Lathe, Cross Sliding Turret, M.D.

### DRILLING MACHINES

4'x13" CARLTON Radial Drill Press, M.D.

6 Spindle 20" No. 2LMS LELAND GIFFORD Drill Press.

28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

5', 6' CINCINNATI-BICKFORD Radial.

### MILLS

No. 3 Cincinnati HSDT Vertical Mill 1944.

No. 56-90 CINCINNATI Duplex Hydromatic Mill, Late Type.

No. 0-8 CINCINNATI Horizontal & Vertical Prod. Mills, M.D.

No. 34-36, 45-48, 48" Cincinnati Duplex Mills. Late Type.

No. 2HL KEARNEY & TRECKER Horiz. Mill, M.D., Late Type.

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late.

No. 3, 4 CINCINNATI HSDT Horiz. Mills, Vert. Heads Extra Table Travel, 1945.

No. 1-14 KENT-OWENS Hydraulic Prod. Mills M.D., Late Type.

### GRINDERS

32" x 12' centers FARREL Traveling Table Type Roll Grinder, New in 1942. Excellent condition.

6" x 18", 6" x 10" x 48" HORTON Hydraulic Horizontal Surface Grinder, Perm Chuck, Late Type.

4T SELLERS Tool Grinder, MD, Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

No. 5 BROWN & SHARPE Hyd. Surface Grinder 8" x 24". Late Type.

No. 13 BROWN & SHARPE Univ. Tool & Cutter Grinder, Late Type.

### MISCELLANEOUS

No. 2112A EXCELLO Boromatic Single End Double Head, Late Type.

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 3, 5 MITTS & MERRILL, No. 5 Davis Keyseaters, M.D.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

20" ROCKFORD Model SA Hydraulic Vertical Slotter, New 1953.

8" CLEVELAND Model A Automatic Screw Machine. Late Type.

No. 9 MARVEL Heavy-Duty Hack Saw 10" x 10' Cap. M.D. Late Type.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

BUY FROM STOCK
*Telephone*
BAKER 5-5887

10 WARD ST.
ROCHESTER 5
N. Y.

## MACHINE TOOLS OF QUALITY

No. 1 Baker Keyseater
No. 2 Cincinnatti centerless lapper, MD new '41
8"x15" Fay automatic lathe
9½" swing 26" centers No. 9 WSL Reid automatic lathe, new 1946
No. 8 Gisholt 12" swing hydraulic auto. lathe
15"x42" Monarch magnamatic automatic lathe
16"x30" centers, 6' bed Reed Prentice Model AA 16 speed geared head, Timken bearing engine lathe
22/46" swing Putnam sliding bed gap lathe, MD
90" swing Betts Bridgeford late type, heavy duty engine lathe headstock only on very short bed
126" swing over bed, 90" swing over carriage, 96' centers, 115' overall length, Niles Bement Pond geared head engine lathe, 80 HP main motor drive
15"x30" Lipe Carbomatic hydraulic prod. lathe
20"x90" centers 11' bed LeBlond geared head Timken bearing production lathe, hard ways.
Model 4D Potter & Johnston high speed automatic turret lathe
No. 5 Gisholt universal ram type turret lathe, bar feed
Model 6DREL Potter & Johnston single spindle manufacturing turret
No. 2L Gisholt universal high production saddle type turret lathe
Model 1H-6 Libby saddle type turret lathe, hard ways, Timken bearings (2)
Model 2H-8 Libby heavy duty saddle type turret lathe, hard ways, Timken bearings (2)
No. 33 Sundstrand Fluidscrew Rigidmil, bed type, production
34-36 Cincinnati duplex hydramatic mill.

*Your latest stock list No. 207 is now ready.*

**MILES MACHINERY COMPANY**
2039 E. Genesee St., Saginaw, Michigan
Telephone Saginaw PL 2-3105

## DEGREASER & CONVEYOR

Model #VM-325-82 Detrex Conveyor Degreaser. Serial #16284, Steam operated, new 1952. Solvent capacity, boil — 60 gal., spray — 100 gal. 10 ga. corrosion resistant steel construction, overall dimensions 38' long, 6½" wide & 13½" high, working opening 18" wide x 24" high. 3" I beam monorail track, 12' to 22' per min. 8' trolley centers, 32" work centers. Hourly capacity 2000 lbs. aluminum or 6000 lbs. steels—3 H.P. 1750 R.P.M. 220/440V solvent spray pumps #8-60 Detrex solvent still Serial #16285. Weight 11,200 lbs. Price $7,500.00

Model #VS-800 Detrex Degreaser Serial #17761. Steam operated manual type, New 1953. Working dimensions, 84" long x 36" wide x 36" deep. Hourly capacity 5000 lbs. steel. 10 ga. plastic coated steel construction. Weight 1,620 lbs. Price $700.00

Keystone Junior Conveyor 3" I Beam. 500 ft. chain & trolley on 9" centers with turns, dips, tractive wheels & take up assembly & Drive unit.
Price $2,300.00

225 Chrome Plated special steel baskets. Rack type.
List price $500.00

**THE ENTERPRISE ALUMINUM CO.**
Phone TE-27485 Massillon, Ohio

## WORLD'S LARGEST STOCK
## STAMPING PRESSES
SQUARING SHEARS • PRESS BRAKES
**REBUILT and GUARANTEED**

WILL LEASE WITH OPTION
TO PURCHASE, OR
WILL FINANCE OVER LONG TERM

**JOSEPH HYMAN & SONS**
TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34, PA Phone GArfield 3-8700

Kodak No. 8U Conju Gear Checker.
Kodak 14" Comp. & gear analy.
3" Gleason Str. Bevel Gen. Ser. 19632.
Cinn. 4-48 Hydro Duplex Mill.

**D. E. DONY MACHINERY CO.**
4357 St. Paul Blvd., Rochester 17, N. Y.

## CHOICE MACHINE TOOLS

K & T 1404 Prod. Mill 1949
CINN. 1-18 Prod. Mill 1951
TOCCO 200 KW. 5,000 cy. 1943
TOCCO 60 KW. 10,000 cy. 1943
GISHOLT #3 Air Chuck & Cyl. 1945
WARNER & SWASEY 2A Bar Feed 1946
3" AJAX Air Clutch Upsetter, 1947
CINCINNATI 5-54 duplex broach, 1948
LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl Grinder 8x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 16x72 Plunge 1945
CINCINNATI 1000 horizontal 2-way, 1946
EXCELLO #33 Thread Grinder 1942
NORTON Cyl. Grinder, 6x18 Plunge 1944
BULLARD RW Vertical Turret Lathe
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 80x80x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads, DC drive
SUMNER & ADAMS Thread Mill, 10", N.I.S. 1943
BIGNALL & KEELER 8" pipe threader, 1940
BIGNALL & KEELER 12" pipe threader, 1940
BIRDSBORO hydraulic straightening press, 660 ton, 88x72 bed, 18" stroke, 38" daylight (3) 1942

**NOLL EQUIPMENT CO.**
4535 St. Clair Ave., Cleveland 3, O.
EXpress 1-0700

## FOR SALE

**MACHINE TOOL BUILDERS OFFER LINE OF RAM TYPE TURRET VERTICAL MILLING MACHINE.**

Sale to consist of the entire business or any portion wanted as listed below:

Patterns, prints, jigs and fixtures, machine parts and assemblies, and rights to our milling machine line.

The line is well established throughout the United States by reputable dealers supplying us with a back log of orders. Machine Tool Business located near Boston, Mass.

**BO-6450, AMERICAN MACHINIST**
Classified Adv. Div., PO Box 12, NY 36, NY

## LARGEST REBUILDING FACILITIES IN U.S.

More than 20 years rebuilding experience with heavy machinery of all industries:—steel mill and power equipment, paper-making machinery, machine tools, etc., etc.

- REBUILDING to Manufacturers Standards
- Modernizations and Conversions to Customer's Specifications.

**S & S MACHINERY CO.**
140 53rd St., Brooklyn 32, N. Y.
HYacinth 2-7400

## BOOKS

*Used by U. S. Armed Forces*
**MACHINE TOOL RECONDITIONING**
*new 3rd printing*
Write for free folder describing illustrated book.
**MACHINE TOOL PUBLICATIONS**
215 Commerce Bldg., 4th & Wabash Sts.
St. Paul 1, Minn.

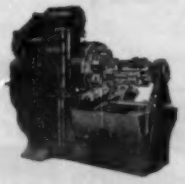
SEARCHLIGHT SECTION

# LAURENS

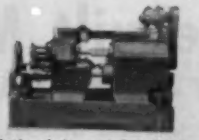
means dependable, technical knowledge, and courteous service to plants all over the World. We guarantee EVERY machine we sell. This means that we are doubly careful about what we ship to you.

No. 521 Heald Single End Borematic, new about 1950, 16" table travel, like new. Two—20" (22½" swing) Sidney Model 32 Herringbone Geared Head Engine Lathes. New in 1953.

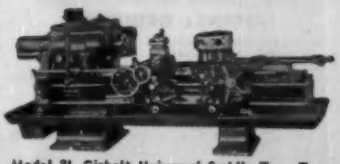
One lathe 120" c/c — One lathe 144" c/c With steel ways, taper attachment, 3 and 4 jaw chucks, rapid traverse, etc.



#76H Baird 6-Spindle, 7" capacity Automatic Chucker, serial 473, latest style, new 1947. Fully equipped and tooled.



RA6 1" National Acme 6-Spindle Automatic Screw Machine, new 1953, with tooling, chip conveyor, etc. Complete, perfect condition.



Model 2L Gisholt Universal Saddle Type Turret Lathe, arranged for chucking work with taper attachment on cross-slide, threading attachment on turret slide through separate gear box, late machine, perfect condition.

Model 12-24 Milwaukee (Kearney & Trecker) Simplex Bed Type Milling Machine, up to 200 RPM. New 1950-51. With coolant equipment, etc.

One — 1⅜" CONOMATIC 6-Spindle Automatic Screw Machine, new in 1953, serial #7087-TA.

Model 2112A Excello Boring Machine. With two DB-24 Heads. New 1953, like new. With hydraulic cross-slide and many extras.

Model #16 Gleason Quenching Press with automatic quenching cycle, controls, motors, die guards, die segments, upper spreader, universal lower die retainer. Serial #27464.

Two—#261 Heald Precision Rotary Surface Grinders, serials 33579. New in 1953. 12" diameter magnetic chucks. For grinding flat, concave and convex surfaces.

Tools
Machine
LAURENS BROS., INC.
2780 HIGHLAND AVE., NORWOOD
CINCINNATI 12, OHIO

## FOR RATES OR INFORMATION

*About Classified Advertising*

## CONTACT THE McGRAW-HILL OFFICE NEAREST YOU

**ATLANTA, 3**
1301 Rhodes-Haverty Bldg. *JAckson 3-6951*
M. MILLER

**BOSTON, 16**
350 Park Square *HUbbard 2-7160*
J. WARTH

**CHICAGO, 11**
520 No. Michigan Ave. *MOhawk 4-5800*
W. HIGGENS

**CINCINNATI, 37**
2005 Seymour Ave. *ELmhurst 1-4750*
F. ROBERTS

**CLEVELAND, 15**
1510 Hanna Bldg. *SUperior 1-7000*
W. SULLIVAN

**DALLAS, 2**
Vaughn Bldg. *Riverside 7-5117*
G. MILLER

**DENVER, 2**
Mile High Center, 1740 Broadway *ALpine 5-2981*
J. PATTEN

**DETROIT, 26**
856 Penobscot Bldg. *WOodward 2-1793*
J. GRANT

**LOS ANGELES, 17**
1125 W. 6th St. *MAdison 6-9351*
H. KEELER
D. McMILLAN

**NEW YORK, 36**
500 Fifth Ave. *Oxford 5-5959*
R. OBENOUR
D. COSTER
R. LAWLESS

**PHILADELPHIA, 3**
17th & Sansom St. *Rittenhouse 6-0670*
H. BOZARTH
R. EDSALL

**ST. LOUIS, 8**
3615 Olive St. *JEfferson 5-4867*
F. HOLLAND

**SAN FRANCISCO, 4**
68 Post St. *DOuglas 2-4600*
R. ALCORN

## PRACTICALLY NEW PRESSES

Warco esp. 600 tons, Bed 180" x 84", Double Roll Feed, Uncoiler, Straightener.
525 tons, Bliss #90½-80, Bed 80"x34", Str. 8"
200 tons, Clearing #7-84, Bed 84"x48", Str. 14"
180 tons, Niagara #612C, Bed 48"x40", Str. 7", New 1948
100 tons, Bliss #6½-80, Bed 80"x38", Str. 8"
160 tons, Niagara #810, Bed 72"x42", Str. 8"
150 tons, Bliss #82-150-60-36, Str. 6", New 1954
140 tons, Bliss #93½-I, Bed 108"x48", Str. 16"
140 tons, Bliss #93½-H, Bed 84"x36", Str. 16"
126 tons, Niagara #68C, Bed 48"x40, Str. 6"
120 tons, Bliss #5½-48W, Bed 48"x30", Str. 8"
*Machines have Air Clutch and some have Air Cushions, and Motor Driven Ram Adjustment.*

*"If it's machinery; we have it."*

**NATIONAL MACHINERY EXCHANGE**
138 Mott St., N. Y. CAnal 6-2470

**MODERN STAMPING SHOP**

has open time on tool, dies and Metal Stampings or Complete Assemblies.

**UNITED TOOL & STAMPING CO.**
Ray Place, Caldwell Twsp., N.J., CA 6-7555

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

### BUSINESS OPPORTUNITY

**German manufacturers of precision machine-tools** want to build machines up to a maximum weight of 10 tons under license for the European market, as supplement and extension of own manufacturing program. Servicing possible. BO-6812, American Machinist.

SEARCHLIGHT SECTION

# Eastern Rebuilt Machine Tools

## THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

### SNAG GRINDERS

Type No. 50—7½ H.P. Standard Elec. Tool Co. Double End, m.d.
25 H.P. U.S. Elec. Co., Heavy Duty Double End, m.d.

### SURFACE GRINDERS

No. 16 Blanchard Rotary, m.d.
No. 16A-2 Blanchard Auto. Rotary, m.d.
No. 33 Abrasive, m.d.
14" Pratt & Whitney Vertical, m.d.
14" Pratt & Whitney Model M1660 Vertical, m.d.
No. A-1—9" Arter Surface Grinder
No. 22—12" Heald Rotary, m.d.
No. 25A—24" Heald Rotary, m.d.
No. 2 Brown & Sharpe, m.d.
#300-80 Hanchett Vertical Spindle, m.d.
10" wide, 24" under wheel, 120" table Mattison, m.d.
Model F, 6x10x18" Thompson Hydraulic Horizontal Wheel, m.d.
Model 84A—61" Bridgeport Hydraulic Face, m.d.
Schoonner Way Grinder, radial arm 14"x16"x48" Thompson Type C Horizontal, m.d.

### THREAD GRINDERS

No. 33 Excello Precision, m.d.

### TOOL & CUTTER GRINDERS

Pratt & Whitney Deep Hole Drill Sharpener, m.d.
No. 1 Heald Tool Sharpener, m.d.
No. 2A Wm. Sellers Universal Tool Grinder, m.d.
No. 2B Sellers Wet Grinder, m.d.
No. 4T Sellers Tool, m.d., latest
No. 5T Sellers, m.d.
No. 6G Sellers, m.d.
No. 13 Gleason Cutter Sharpener, m.d., late
Improved Face Mill Grinder
No. 13 Brown & Sharpe Universal Cutter Grinder, m.d.
12" Gleason Spiral Bevel Gear Cutter Sharpener, m.d.
No. 4-4 Barber-Colman Hob Sharpener
Sundstrand Tool Grinder, m.d.

### UNIVERSAL GRINDERS

10x24" Landis Type C, m.d.
12x48" Norton, m.d., latest
14"x48" Landis Universal
14x36" Norton, m.d.
14x72" Norton Universal Hydraulic, m.d.

### INTERNAL GRINDERS

Type 10 103 Greeby, m.d.
No. 5 Bryant, m.d., latest
Model 5Y Bryant, m.d.
No. 16—16" Bryant, m.d., hydraulic Hole Grinder
No. 16C&16 Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16—36" Bryant, m.d., latest
No. 16A—22" Bryant, m.d.
No. 2—36" Bryant Hole & Face Type, m.d., late
No. 24P—20" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 24L—36" Bryant, m.d., late
No. 24LW—36" Bryant, m.d., late
No. 44 Heald Facing Type Borematic, m.d.
No. 049—16" Van Norman Automatic Oscillating Radius, m.d., latest
No. 70A Heald, m.d., latest, 1945
No. 72A3 Heald Full Universal, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Plain, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 72 Heald, m.d.
No. 74 Heald Long Base, 1943
No. 74 Heald Extended Bridge Type, m.d.
No. 75A Heald, m.d., latest
No. 74 Heald, Plain Long Base, m.d., 1941
No. 81 Heald Gagematic, Sizematic, m.d.
No. 81 Heald Plain & Sizematic, m.d.
No. 104 Rivett, m.d.
No. 172 Heald Plain Adjustable Gap Hydraulic, m.d.
Model DB-102 Excello Double End Boring Machine, m.d.

### PLAIN CYLINDRICAL GRINDERS

No. 5 Brown & Sharpe Plain Cylindrical, m.d., 1942
No. 10 Brown & Sharpe, m.d.
No. 20—10-18" cap. Brown & Sharpe Plain Cylindrical, m.d.
5x18" Ott Plain Cylindrical, m.d.
6x18" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Cincinnati Model ER, Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
6x18" Norton Plain Grinder, m.d.
10x18" Cincinnati Plain Hydraulic, Model ER, m.d. Filmatic Spindle, 1943
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x30" Norton Type C, m.d.
10x30" Landis Type CH Plain, m.d.
12x30" Landis Plain Self-Contained, m.d.
14x30" Landis Type C, 1944
18x72" Centers Type C Norton Semi-Auto., Hydraulic
18x48" Landis Type D, 1945
18x90" Cincinnati Plain Cylindrical, m.d.
18x40x120" Cincinnati Plain Heavy Duty, 1953
19"x120" Landis Type B Plain H.P., Hydraulic, m.d., late
18x36" Landis Type C, m.d.
18x72" Norton Type C, Mechanical, m.d.
25"x72" Landis Type C, m.d.

**SEND FOR COMPLETE STOCK LIST**

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio MElrose 1-1241 "TWX" CI-174
CABLE ADDRESS EMCO

# SEARCHLIGHT Equipment Spotting SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

First, read the dealer ads on the Searchlight pages. A 5-minute study may locate the equipment now.

Second, send in the specifications of the equipment wanted on the coupon below, or on your own company letterhead, to

**SEARCHLIGHT EQUIPMENT SPOTTING SERVICE, c/o American Machinist, P. O. Box 12, N. Y. 36, N. Y.**

Your requirements will be brought promptly to the attention of the used equipment dealers advertising in this issue. You will receive replies directly from them. NO CHARGE • NO OBLIGATION

Please help us locate the following equipment:

.....

.....

NAME ..... TITLE ..... COMPANY .....

STREET ..... CITY ..... ZONE ..... STATE .....

12/30/57

## Index of PRODUCTS ADVERTISED In This Issue


Abrasives, Coated ..... 19, 21
Abrasives, (Not Bonded) ..... 19
Accessories & Attachments (Machine Tool) ..... 36

Bearings ..... 4th Cover
Boring, Drilling & Milling Machines (Horizontal) ..... 14-15
Boring Machines, Internal ..... 2nd Cover, 54
Boring & Turning Machines (Vertical) ..... 154
Broaching Machines & Equipment 26-27

Cams ..... 144
Chucks ..... 3rd Cover, 155
Collets ..... 39
Controls, Electrical ..... 20
Counters ..... 32
Cut-Off Machines ..... 37, 132

Drilling Machines ..... 50-51, 129
Duplicators & Pantographs ..... 144
Dust Collectors ..... 142

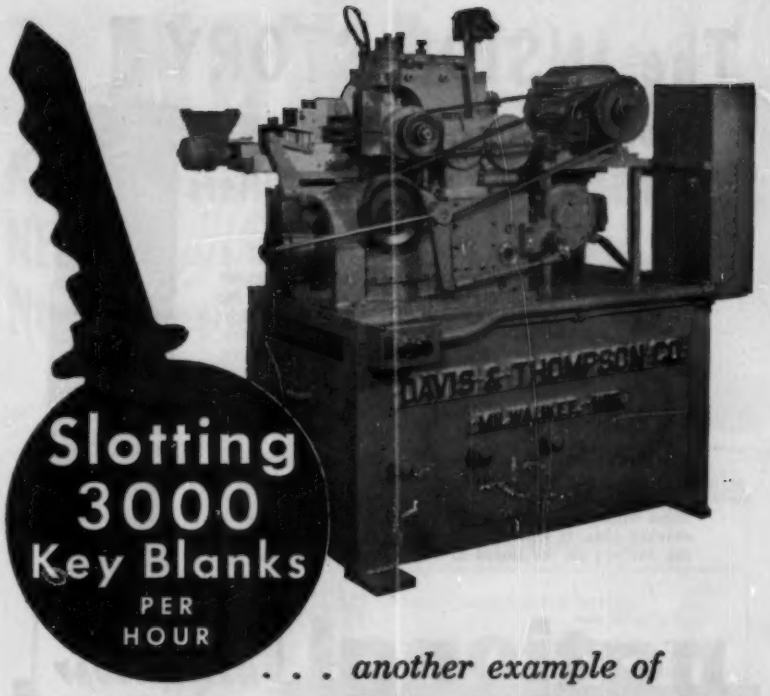
Electrical Parts & Equipment ..... 20
Engineering & Production Services ..... 140

Fabricating Methods & Services ..... 140

Gages, Instruments & Testing Equipment ..... 40-41, 42, 135, 144, 153, 156
Gear Cutting Machines ..... 6-7
Gears, Speed Reducers, Motor Reducers ..... 139
Gear Testers ..... 6-7
Grinders—Cutter & Tool ..... 142
Grinding Machines—Production ..... 8-9, 12-13, 16-17, 33
Grinding Wheels ..... 19, 21, 34-35

Heads: Drilling, Grinding & Tapping ..... Insert Facing 33, 47






*. . . another example of*
*Davis & Thompson Production Engineering*

If you need high production in milling, drilling, boring and similar metalworking operations . . . with a minimum of equipment and capital expenditure, call in a Davis and Thompson Representative.

This key blank slotting machine is only one of countless machining problems solved by D & T Engineers.

Space does not permit describing this machine in full detail, but if you would like complete details, write.

**ADDITIONAL INFORMATION**

Get the complete story of the facilities available from Davis and Thompson. Write for this 8-page bulletin today. Ask for Bulletin 1002.

Koto-Matic

**Davis and Thompson Co.**

4460 N. 124th ST. . . . MILWAUKEE 10, WISCONSIN

**NEW MODEL**

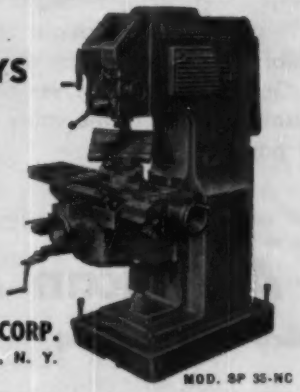
**TRIPLEX-MATHEYS JIG BORER**

Optical positioning in 21" x 12" area. 2½ HP motor. Amer. Standard spindle nose. 100-2000 RPM infinitely variable spindle speed.

ACCURATE • VERSATILE
DEPENDABLE

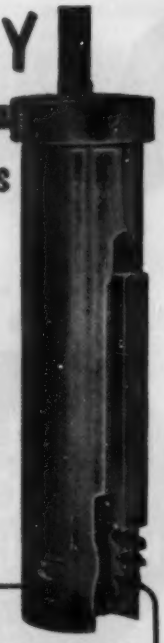
*for full details write to*

**TRIPLEX MACHINE TOOL CORP.**
75 WEST STREET, NEW YORK 4, N. Y.
HAnover 2-4520



MOD. SP 33-NC

# The INSIDE STORY about NATIONAL Keyseating Millers



**NATIONAL** Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

**CUTTERS** are made from high speed steel which are hardened to Rockwell specifications and accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

**national**
MACHINE TOOL CO.
CINCINNATI 22, OHIO

*WRITE TODAY*
for Catalog No. 17
complete, handy size



# PRECISION PRODUCTION at GRAFLEX

At Graflex, Inc., in Rochester, N.Y., operators inspect their own work and get paid for it, and foremen have full freedom of action. These are just two important characteristics of the organization of the camera and precision-equipment manufacturer bearing this familiar name.

This *American Machinist* Special Report by Executive Editor E. J. Tangerman describes production methods at Graflex in detail. Over fifty photographs and other illustrations add to the value of the twenty-page report.

*20 pages — — — 25 cents per copy*

***Reader Service Department***

**American Machinist**

**McGraw-Hill Building** **New York 36, N. Y.**


## Index of PRODUCTS ADVERTISED In This Issue


Hydraulic & Pneumatic Parts & Equipment ..... 65, 102

Jig Borers ..... 151, 155
Jigs & Fixtures ..... 140

Keyseaters ..... 144, 152

Lathes, Engine ..... 45, 143
Lathes, Turret ..... 22-23, 43
Lubricants, Cutting Fluids, Quenching Oils & Solvents ..... 62, 136-137

Marking Machines, Tools, & Supplies ..... 48
Materials, Cutting & Forming ..... 18
Materials of Manufacture ..... 44, 66, 104, 106, 108, 131
Materials Handling Equipment ..... 38, 153
Millers, Die Sinkers, Profilers ..... 4-5
Motors, Electrical ..... 60

Planers ..... 28-29
Presses, Forging & Forming Equipment & Supplies ..... 24-25, 37, 58, 101, 132, 138

Riveting Machines ..... 65, 144

Saw Blades ..... 144
Sawing Machines ..... 141, 144
Screw Machines; Chucking Machines ..... 47, 52, 133
Shapers & Slotters ..... 68, 151
Special Machine Tools ..... 30-31, 140

Tapping Machines ..... 50-51, 129
Thread Rolling Machines & Tools ..... 10-11, 49
Tools, Cutting ..... Insert Bet. 32-33, 46, 56
Tools, Hand ..... 36
Tools, Measuring ..... 155

Used & Surplus Equipment ..... 146-150

# INDEX TO ADVERTISERS

*This index is published as a convenience to the readers. Every care is taken to make it accurate, but American Machinist assumes no responsibility for errors or omissions.*


| | Page |
|---|---|
| American Brass Company | 108 |
| American Chain Division American Chain & Cable Co., Inc. | 38 |
| American Chain & Cable Wilson Mechanical Instrument Div. | 156 |
| American Tool Works Co. | 45 |
| Armco Steel Corporation | 66 |
| Armstrong Blum Mfg. Co. | 144 |
| Armstrong Brothers Tool Company | 36 |
| Bath Company, Cyril | 58 |
| Bay State Abrasive Products Co. | 34-35 |
| Bay State Tap & Die Company | 56 |
| Blanchard Machine Co. | 33 |
| Brandes Press Co. | 101 |
| Cincinnati Grinders Incorporated | 16-17 |
| Cincinnati Milling Machine Company | 4-5 |
| Cincinnati Shaper Company | 68 |
| Columbus Die-Tool & Machine Co. | 140 |
| Cone Automatic Machine Co. | 52 |
| Copperweld Steel Company | 106 |
| Crucible Steel Co. of America | 18 |
| Davis Keyseater Company | 144 |
| Davis & Thompson Company | 151 |
| Dearborn Gage Co. Air Gage Division | 42 |
| DoAll Company | 141 |
| Dreis & Krump Manufacturing Co. | 132 |


(*Continued on page* 154)

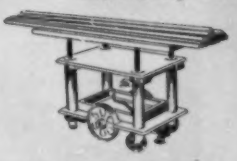

5603

**NOW!**

NEW *Convenience*
NEW *Capacities*
NEW *Designs*

**PORTELVATOR®**

The Handy HAMILTON Portable, Elevating Table



NEW provision for increasing table area!

NEW provision for raising and lowering overhanging loads!

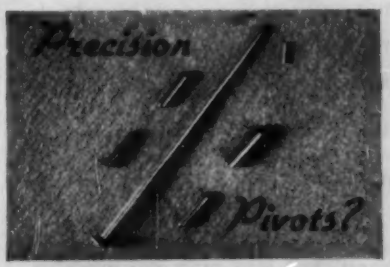
NEW convenience in maneuvering! Six wheel models roll easier . . . turn shorter.

NEW overhanging conveyor tops!

**More stamina, more versatile performance than ever before**

**NEW FREE LITERATURE** illustrates and describes all! Write for Bulletin P-5603. Address, The Hamilton Tool Company, 830 South Ninth Street, Hamilton, Ohio.

REPRESENTED IN CANADA BY
Sykes Tool Corporation, Ltd., 123/131 York Street, Toronto
Sykes Tool Corporation, Ltd., 515 Bisson Street, Montreal




The "spike" in the center is a common pin. The others are VK precision pivots.

**Call VK**

Steel, chromium plated, or carbide precision pivots to .013" diameter. 1 RMS or finer surface finish. Diameter tolerance to .000010". Chamfers, radii, lapped ends, etc.

Also volume production lapping of flat or round production parts.

Send us your specifications.

**The VAN KEUREN COMPANY**
176-C WALTHAM ST. WATERTOWN, MASS.

**FAV 500 C**

**PRECISION VERTICAL MILLING AND BORING MACHINE**

MINGANTI
BOLOGNA

| | |
|---|---|
| Table | 30 1/2" x 61 3/4" |
| Power | HP 12 |
| Weight | lbs. 28500 |

**GIUSEPPE MINGANTI & C.**
BOLOGNA (Italy)

EXPORT OFFICE
MILANO (Italy) Piazzale P.ssa Clotilde, 8


## From the *American Machinist* Library of *Tips for Top Shop Men*

THE really competent man multiplies his effectiveness by every man he influences. One man, no matter how able, is still one man, but one man believed in by enough others is unbeatable.

## INDEX TO ADVERTISERS

(*Continued from page* 153)


| | Page |
|---|---|
| Eastman Kodak Co. | 135 |
| Eisler Engineering Co., Inc. | 144 |
| Ex-Cell-O Corporation | 54 |
| Fellows Gear Shaper Company | 6-7 |
| Gardner Machine Company | 21 |
| Giddings & Lewis Machine Tool Co. | 14-15 |
| Gisholt Machine Company | 43 |
| Goss & deLeeuw Machine Company | 133 |
| Grant Mfg. & Machine Company | 144 |
| Gray Co., G. A. | 28-29 |
| Greenfield Tap & Die Corp. | Insert Bet. 32-33 |
| Hamilton Tool Company | 153 |
| Hardinge Brothers, Inc. | 39 |
| Heald Machine Co. Sub. Cincinnati Milling Machine Co. | 2nd Cover |
| Horton & Sons Co., E. | 3rd Cover |
| Hydraulic Press Mfg. Co. Div. of Koehring Co. | 24-25 |
| Kingsbury Machine Tool Corp. | 129 |
| Landis Machine Company | 10-11 |
| Landis Tool Company | 12-13 |
| LaPointe Machine Tool Company | 26-27 |
| Lavallee and Ide, Inc. | 46 |
| Linley Brothers Co. | 155 |
| Lodge & Shipley Company | 37 |
| Master Electric Company | 60 |
| M.B.I. Export & Import Ltd. | 155 |
| McDonough Manufacturing Co. | 142 |

# INDEX TO ADVERTISERS


| | Page |
|---|---|
| Minganti & Co., Giuseppe | 154 |
| Mueller Brass Company | 44 |
| National Acme Company | 47 |
| National Automatic Tool Co., Inc. | 50-51 |
| National Machine Tool Company | 152 |
| Noble & Westbrook Mfg. Co. | 48 |
| Norton Company | 19 |
| Perkins Machine & Gear Company | 139 |
| Reed Rolled Thread Die Company | 49 |
| Rivett Lathe and Grinder, Inc. | 143 |
| Sharon Steel Corporation | 131 |
| Shore Instrument & Mfg. Co. Inc. | 144 |
| Snyder Tool & Engineering Co. | 30-31 |



**American Machinist**

**ADVERTISING SALES STAFF**

**Atlanta 3** . . . M. H. Miller, 1301 Rhodes-Haverty Bldg., Jackson 3-6951

**Boston 16** . . . J. H. Koch, 350 Park Square Bldg., Hubbard 2-7160

**Chicago 11** . . . W. J. Haring, Bayard Nicholas, 520 N. Michigan Ave., Mohawk 4-5800

**Cincinnati 8** . . . R. H. Anderson, 2637 Erie Ave., East 1-6110

**Cleveland 15** . . . Gifford W. Plume, Jr., 1510 Hanna Bldg., Superior 1-7000

**Dallas 1** . . . E. E. Schirmer, 901 Vaughn Bldg., 1712 Commerce St., Riverside 7-5117

**Denver 2** . . . John W. Patten, Mile High Center, 1740 Broadway, Alpine 5-2981

**Detroit 26** . . . W. P. Reichard, 856 Penobscot Bldg., Woodward 2-1793

**Los Angeles 17** . . . H. L. Keeler, 1125 West Sixth St., Madison 6-9351

**New York 36** . . . G. H. Krimsler, D. C. Sawyer, 500 Fifth Ave., Oxford 5-5959

**Philadelphia 3** . . . J. P. Tiebout, Architects' Bldg., 17th & Sansom Sts., Rittenhouse 6-0670

**Pittsburgh 22** . . . K. Reeves Cook, 1111 Oliver Bldg., Atlantic 1-4707

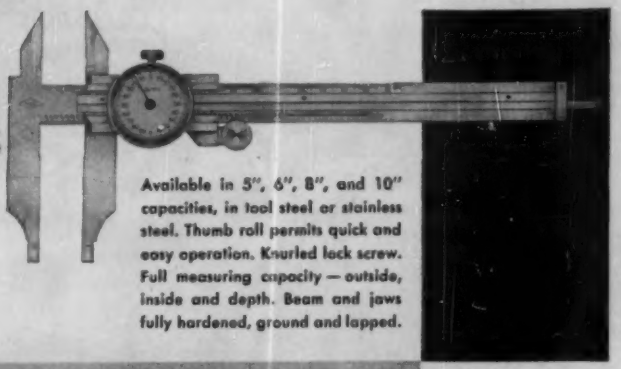
**St. Louis 8** . . . Bayard Nicholas, 3615 Olive St., Continental Bldg., Jefferson 5-4867

**San Francisco 4** . . . R. C. Alcorn, 68 Post St., Douglas 2-4600

**England** . . . Herbert Lagler, McGraw-Hill House, 95 Farringdon St., London, E. C. 4



## DIAL VERNIER CALIPERS



With Dial Indicator Reading Directly In .001" Eliminates Costly Reading Errors

Available in 5", 6", 8", and 10" capacities, in tool steel or stainless steel. Thumb roll permits quick and easy operation. Knurled lock screw. Full measuring capacity — outside, inside and depth. Beam and jaws fully hardened, ground and lapped.

## KEYLESS DRILL CHUCKS

CAPACITIES UP TO ½"

ALL OPERATING PARTS HARDENED AND INTERCHANGEABLE

**SELF-TIGHTENING:**
Tighten the easy-grip sleeve by hand and the tool is chucked. Drill shank does not slip since the gripping power of the chuck increases with the load.

**QUICK CHANGE OF TOOLS:**
Built-in ball bearing; drill chuck therefore easily opened by hand despite tremendous gripping power.

*Tested For Performance To American Standards*

ALSO AVAILABLE:
- Multi-Purpose Vises
- Reversible Safety Tapping Attachments
- Quick Change Chucks & Collets

*Immediate Delivery From N. Y. Stock*

*DISTRIBUTOR INQUIRIES INVITED*

Our Headquarters in New York City

MBI

## M. B. I. export & import ltd.

A Division of Machinery Builders Inc.
475 Grand Concourse, Bronx 51, New York
Phone: MOtt Haven 5-0900

*"Over 25 years experience in designing and building machinery"*

Write for Descriptive Booklet and prices.

## Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work? Put your small work on the LINLEY where it belongs and reserve your large machines for large work, where large work belongs. You'll save money this way.

***SPECIFICATIONS***

**Table Movement: 6" x 10" — Table Size: 7" x 17½"**

***Complete details sent promptly on request***

**LINLEY BROTHERS CO.**
**664 STATE ST. EXT., BRIDGEPORT 1, CONN.**

WILSON "ROCKWELL"—
THE WORLD'S STANDARD OF HARDNESS TESTING ACCURACY

WILSON "ROCKWELL"
HARDNESS TESTERS

A FULL WILSON LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT

FULLY AUTOMATIC
•
SEMI-AUTOMATIC
•
REGULAR
•
SPECIAL
•
SUPERFICIAL
•
MICRO & MACRO HARDNESS TESTERS

**When it's WILSON "ROCKWELL"-TESTED *you KNOW it's RIGHT!***

*Easy to operate*—all controls at hand. *Takes rough service*—maintains accuracy after years of operation.

*Expert Wilson Service*—helps you choose proper model...keeps it at work. A staff of WILSON hardness testing experts is available to provide quick emergency service if it is ever needed.

*The booklets listed below give complete and helpful data on the indicated* WILSON *equipment...*
DH-325 for "Rockwell" Regular
DH-326 for "Rockwell" Superficial
DH-327 for Accessories & Specials

ACCO WILSON
MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE
230-B Park Avenue, New York 17, N. Y.

Write for one or all of these booklets
DH-325
DH-326
DH-327

## From the *American Machinist* Library of *Tips for Top Shop Men*

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

# INDEX TO ADVERTISERS

(*Continued from page* 155)

Page

Standard Oil Co. (Indiana) .....136-137

Taft-Peirce Mfg. Co. .....40-41
Tannewitz Works .....144
Texas Co. .....62
Timken Roller Bearing Co. .....4th Cover
Tomkins-Johnson Company .....65
Torit Manufacturing Company .....142
Triplex Machine Tool Corp. .....151
Turchan Follower Machine Company....144

Van Keuren Company .....153
Van Norman Machine Company .....8-9
Veeder-Root Inc. .....32
Verson Allsteel Press Co. .....138
Vickers, Incorporated Div. of Sperry-Rand Corporation .....102

Warner & Swasey Company .....22-23
Westinghouse Electric Corp. .....20
Wilson Mechanical Instrument Division, American Chain & Cable Co., Inc..156

Youngstown Sheet & Tube Company.....104

## CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EDUCATIONAL
Books ..... 148
BUSINESS OPPORTUNITIES
Offered ..... 148
EQUIPMENT
(Used or Surplus New)
For Sale .....146-150

ADVERTISERS INDEX

Bennett Machinery Co. ..... 147
Dony Machinery Co., D. E. ..... 148
Eastern Machinery Co. .....147, 150
Enterprise Aluminum Co., The..... 148
Falk Machinery ..... 148
Hazard-Brownell Machine Tools Inc... 147
Hyman & Sons, Joseph ..... 148
Laurens Bros., Inc. ..... 149
Machine Tool Publications ..... 148
McDonald Machinery Co. ..... 147
Miles Machinery Co. ..... 148
National Machinery Exchange ..... 150
Noll Equipment Co. ..... 148
S & S Machinery Co. ..... ..146, 148
Sal Metal Products Co. ..... 147
United Tool & Stamping Co. ..... 150

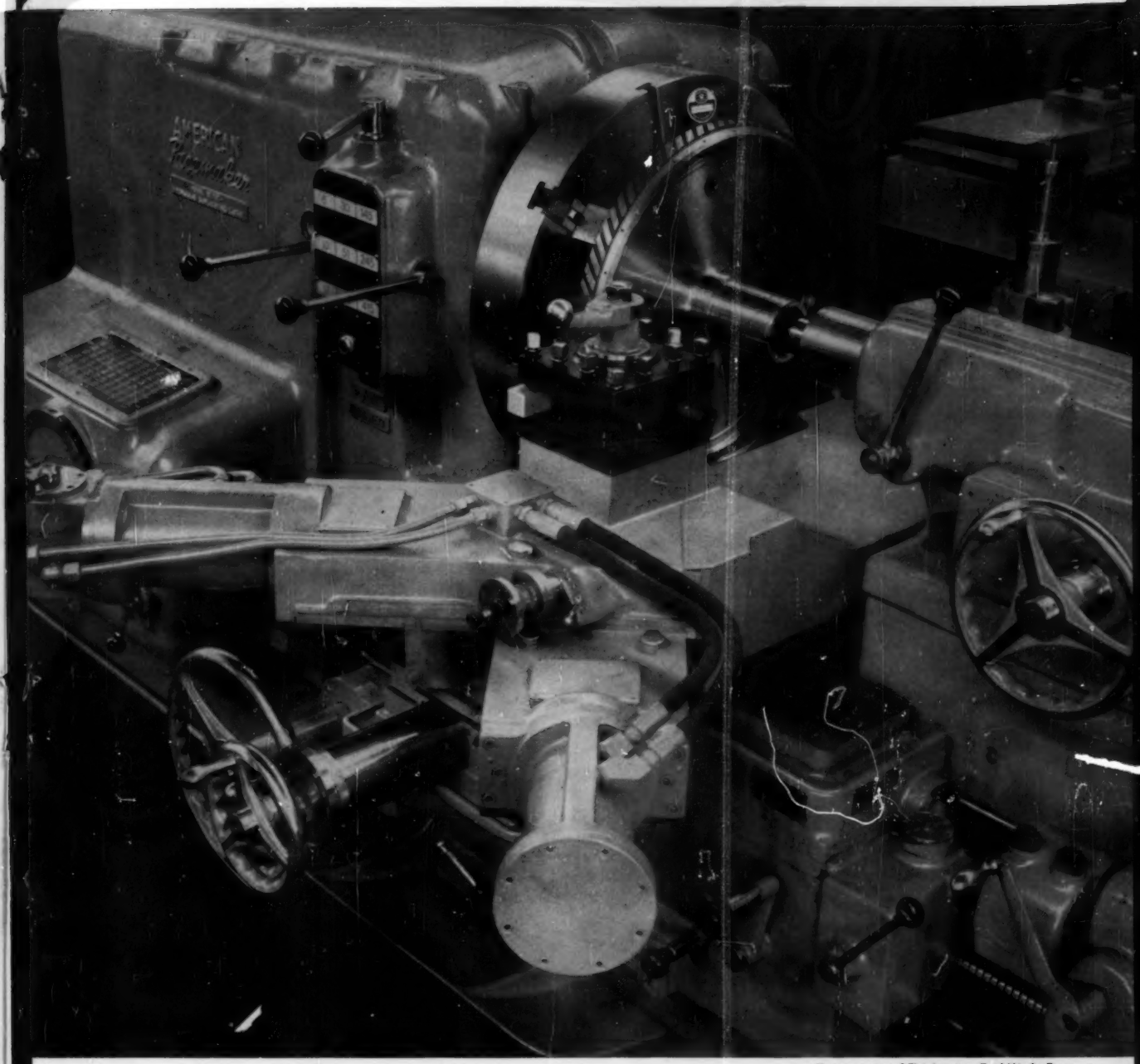


Photo courtesy of The American Tool Works Company

**THE LATHE** — *American Pacemaker 25" Style "G" Hydraulic Duplicating Lathe*

**THE OPERATION** — *Machining a jet engine compressor wheel*

**THE CHUCK** — *Horton, of course*

*new plant ★ new facilities ★ new address*

**HORTON CHUCK DIVISION**

GREENFIELD TAP AND DIE CORPORATION

VALLEY & BLAKE STREETS • NEW HAVEN 15, CONN.

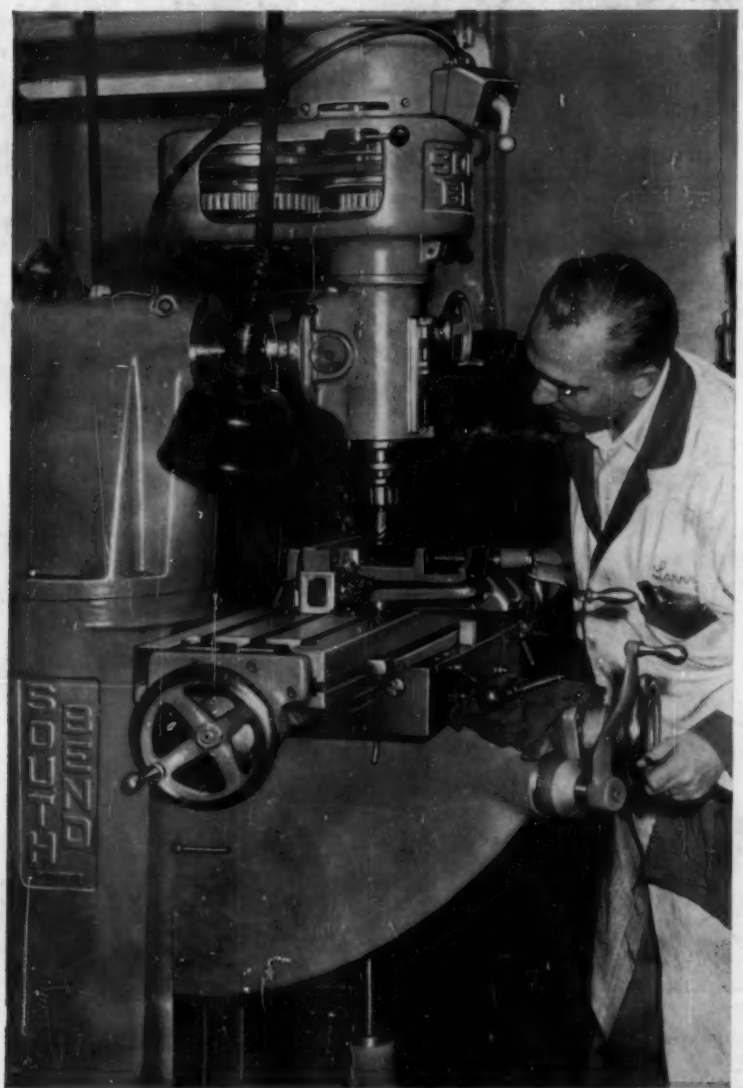
*same personnel ★ same quality ★ same service*

HORTON Since 1851 CHUCK

***Call Your Horton Distributor Now!***

**g machine spindle**

# Precision milling machine spindle gets extra precision with TIMKEN® bearings




**SOUTH BEND LATHE WORKS** mounts the adjustable spindle of their vertical precision milling machine on two Timken tapered roller bearings to give it extra accuracy in any position. They also use Timken bearings in the elevating screw mechanism.

AT all eight speeds and at any angle, this vertical milling machine mills, drills and bores to fine tolerances. And to give the spindle extra precision in every position, South Bend Lathe Works mounts it on two Timken® tapered roller bearings. These Timken bearings:

**HOLD THE SPINDLE RIGID AT ANY ANGLE.** Regardless of operating position and work loads, Timken bearings keep the spindle in positive alignment. Their tapered design lets them take *both* radial and thrust loads in any combination.

**TAKE HEAVY LOADS, RESIST WEAR.** Full line contact between rollers and races gives Timken bearings load-carrying capacity to spare. And both rollers and races are case-carburized to give them hard, wear-resistant surfaces over tough, shock-resistant cores. They last longer, reduce maintenance.

**CUT MAINTENANCE COSTS.** Timken bearings hold shafts concentric with their housings. Dirt stays out; lubricant stays in. They are geometrically designed to roll true, precision-made to make sure they do. We even make our own steel. No other American bearing manufacturer takes this extra step to insure the highest quality.

Whether you buy machines or build them, make sure you get the best bearings. Look for the trade-mark "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

*This symbol on a product means its bearings are the best.*

**TIMKEN** *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.